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## (12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau(43) International Publication Date  
17 May 2001 (17.05.2001)

PCT

(10) International Publication Number  
WO 01/34213 A1

- (51) International Patent Classification<sup>7</sup>: A61L 9/14, 9/012, A01N 37/02, 25/08, A61L 9/01 // (A01N 37/02, 37:46, 25:08)
- (21) International Application Number: PCT/US99/26582
- (22) International Filing Date:  
9 November 1999 (09.11.1999)
- (25) Filing Language: English
- (26) Publication Language: English
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- (81) Designated States (national): AE, AL, AM, AT, AT (utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, CZ (utility model), DE, DE (utility model), DK, DK (utility model), DM, EE, EE (utility model), ES, FI, FI (utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

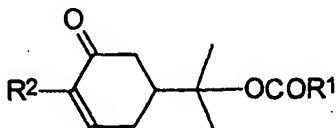
## Published:

— With international search report.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

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(54) Title: CYCLODEXTRIN COMPOSITIONS FOR ODOR, INSECT AND DUST MITE CONTROL



(I)

(57) Abstract: A stable, aqueous odor-absorbing, insect and dust mite controlling composition, preferably for use on inanimate surfaces. The composition comprises a solubilized, water-soluble, cyclodextrin and an effective amount of an insect and dustmite repellent active component, which can be N,N-diethyl-m-toluamide or an active component of general formula (I) wherein R<sup>1</sup> and R<sup>2</sup> are independently selected from the group consisting of

saturated, straight or branched alkyl groups having from 1 to about 10 carbons. The active component is provided in an intimate mixture with an oily component capable of solubilizing the active component.

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## CYCLODEXTRIN COMPOSITIONS FOR ODOR, INSECT AND DUST MITE CONTROL

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### TECHNICAL FIELD

The present invention relates to stable, preferably clear, aqueous odor-absorbing compositions, articles of manufacture, and/or method of use, comprising solubilized, cyclodextrin and an active dust mite and insect repellent component. The active dust mite and insect repellent component is preferably added to the odor absorbing composition as an intimate mixture with an oily component.

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### BACKGROUND OF THE INVENTION

Consumers find certain odors offensive. Likewise, insects and small arachnids, such as dust mites, can be both offensive and unhealthy. Odor causing chemicals often exist on the same surfaces where insects and mites reside. For example, furniture and carpets in a home can be sources for malodorous chemical as well as insects and mites. Other inanimate objects such as the surfaces found in automobiles, can be the source of unpleasant odors, insects and mites. Masking odors with perfumes and other scented or naturally fragrant materials is a well known practice. But masking one offensive odor with a less offensive odor does not address the cause of the offensive odor. Nor does this practice address the removal of insects or mites. That is, the malodor, insects and mites all remain, they are simply covered up by the perfume or other fragrance. It is often more desirable to remove or neutralize the odor causing chemicals so that masking scents are unnecessary. And it would be extremely advantageous if odor could be removed with the same composition that repels or kills insects and mites.

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Unfortunately, offensive odors can be caused by a variety of different chemical compounds. And insects and mites are repelled and killed by only a limited number of

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chemicals that are, unfortunately, species specific. For example, a chemical that is excellent for killing mosquitoes may be completely ineffective for repelling or killing dust mites. Thus, the combination of odor neutralization and insect/mite repellence, becomes a diverse and often times, difficult task. Moreover, for use on inanimate surfaces, the chemical compositions must be relatively nontoxic and not harmful to fabrics, upholstery, carpets and other common surfaces where odors, insects and mites reside. For example, a composition that stains carpets will be coldly received by consumers regardless of how well it removes odors or repels insects and mites.

Certain cyclodextrin containing compositions are extremely effective for removing malodors from surfaces, but they are relatively ineffective for repelling insects and mites. Moreover, cyclodextrin is best formulated in an aqueous solution, but some desirable and highly effective compounds for killing and repelling insects and mites are not readily soluble in water. Thus, the formulator must be careful when selecting not only the active chemicals, but the carrier as well. This presents many challenges for the formulator of such odor neutralization and insect/mite control formulations.

Many substances have been suggested through the years to be used in products as insect repellent actives including d-8-ACA, disclosed in Chinese patent application No. 94100746, Hanzhi et al., filed on July 2. d-8-ACA is both natural and safe to the human and provides good repellent efficacy for insect and dust mites instead of killing them. This active is typically provided in a crystallized form. But the liquid form of 8-ACA is believed to be the much more efficacious. d-8-ACA is generally water soluble. Unfortunately, however, when an aqueous solution containing d-8-ACA is applied to a surface, the d-8-ACA crystallizes when the water carrier evaporates. This creates a problem, because crystalline d-8-ACA is substantially less effective as a repellent than d-8-ACA in the liquid form.

Hence, it is desirable to provide chemical compositions that are effective in the neutralization of odors and repelling or killing insects and mites. It is further desired to provide these compositions in an easily deliverable form that is compatible with a wide variety of common surfaces, such as fabrics, upholstery, carpets and other surfaces where odors, insects and mites reside. And it is desirable to provide these products in an aqueous based composition.

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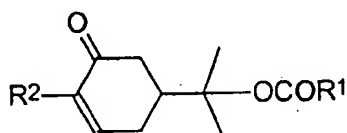
### SUMMARY OF THE INVENTION

The present invention relates to stable, preferably clear, aqueous odor absorbing and insect and mite repelling compositions, articles of manufacture and/or method for use, especially on inanimate surfaces, that is, other than directly on human skin. Preferably, the compositions are sprayed onto fabrics, particularly clothes, to restore their freshness by reducing malodor without washing or dry cleaning. The aqueous odor-absorbing compositions are also preferably for use on other inanimate surfaces, such as household upholsteries, drapes, carpets, car interiors, and the like.

In a preferred embodiment of this invention there is provided a stable, aqueous odor-absorbing composition comprising:

- (A). an effective amount to absorb malodors of solubilized, cyclodextrin;
- (B). an insect and mite repellent composition which is in the form of a non-aqueous composition comprising an intimate mixture of:

- (1) an effective amount of an active component having the following formula:



wherein R<sup>1</sup> and R<sup>2</sup> are independently selected from the group consisting of saturated, straight or branched alkyl groups having from 1 to about 10 carbons, preferably R<sup>1</sup> and R<sup>2</sup> are independently selected from saturated, straight or branched alkyl group of from 1 to about 3 carbons; and

- (2) an oily component capable of solubilizing the active component, wherein the oily component preferably has a melting point of less than 50 °C, and is selected from the group consisting of mineral oil, petrolatum, straight or branched, saturated or unsaturated hydrocarbons having from about 7 to about 40 carbon atoms, vegetable oils, hydrogenated vegetable oils, animal fats, animal oils, and C1-C30 mono- and poly- esters of sugars, and mixtures thereof;

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- (C) optionally, from about 0.01% to about 30% by weight of the composition of low molecular weight alcohols, which preferably comprises ethanol; and
- (D) an aqueous carrier.

In one aspect of the present invention, the stable, aqueous odor-absorbing composition comprises an insect and mite repellent composition selected from the group consisting of N,N-diethyl-m-toluamide, a non-aqueous composition and mixtures thereof. Wherein the non-aqueous composition is defined in section (B) above.

The cyclodextrin is preferably present at a level of from about 0.01% to about 20%, more preferably, from about 0.01% to about 5%, even more preferably, from about 0.1% to about 3%, by weight of the composition. The active component is preferably present at a level of from about 0.01% to about 8%, more preferably, from about 0.03% to about 5%, and even more preferably, from about 0.05% to about 1%, by weight of the composition. The compositions of this invention can further comprise an effective amount of an emulsion forming component selected from the group consisting of a cyclodextrin compatible surfactant, a cyclodextrin compatible emulsifier, and mixtures thereof.

The cyclodextrin of the present invention is selected from the group consisting of beta-cyclodextrin, alpha-cyclodextrin, gamma-cyclodextrin, derivatives of the cyclodextrins, and mixtures thereof. Wherein the cyclodextrin derivatives are selected from the group consisting of methyl substituted cyclodextrins, ethyl substituted cyclodextrins, hydroxyalkyl substituted cyclodextrins, branched cyclodextrins, cationic cyclodextrins, quaternary ammonium cyclodextrins, anionic cyclodextrins, amphoteric cyclodextrins, cyclodextrins wherein at least one glucopyranose unit has a 3-6-anhydro-cyclomalto structure, and mixtures thereof. Preferably, the cyclodextrin is methylated beta-cyclodextrin. And even more preferably, the cyclodextrin is a mixture of methylated alpha-cyclodextrin and methylated beta-cyclodextrin. In yet another preferred embodiment of this invention the cyclodextrin is hydroxypropyl beta-cyclodextrin.

In another aspect of this invention, the compositions, additionally comprise adjuvant components selected from the group consisting of: low molecular weight polyols; an aminocarboxylate chelator; an effective amount of metallic salt for improved odor benefit; an effective amount of solubilized, water-soluble, antimicrobial preservative; an effective amount, to kill, or reduce the growth of microbes, of cyclodextrin compatible and water soluble antimicrobial active; and mixtures thereof.

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The present invention also relates to the compositions incorporated into a spray dispenser to create an article of manufacture that can facilitate treatment of articles and/or surfaces with said compositions containing cyclodextrin, an active component and other optional ingredients at a level that is effective, yet is not discernible when dried on the surfaces.

The present invention also comprises the use of small particle diameter droplets of the compositions herein, to provide superior performance, e.g., the method of applying the compositions to fabrics, etc. as very small particles (droplets) preferably having average particle sizes (diameters) of from about 10  $\mu\text{m}$  to about 120  $\mu\text{m}$ , more preferably from about 20  $\mu\text{m}$  to about 100  $\mu\text{m}$ .

#### DETAILED DESCRIPTION OF THE INVENTION

As used herein, "safe and effective amount," means an amount of a compound or composition sufficient to significantly induce a positive benefit, preferably a positive skin appearance or feel benefit, including independently the benefits disclosed herein, but low enough to avoid serious side effects, for example, to provide a reasonable benefit to risk ratio, within the scope of sound judgment of the skilled artisan.

As used herein, "cyclodextrin compatible" means that the cyclodextrin and the other material, or active, do not substantially interact so as to eliminate the odor controlling ability of the cyclodextrin or the desired effect of the material or active.

#### I. COMPOSITION

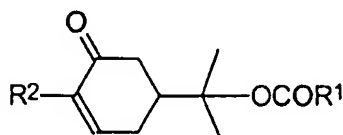
##### *INSECT AND MITE REPELLENT COMPOSITION*

The stable, aqueous odor-absorbing compositions of the present invention contain a safe and effective amount of an insect and mite repellent composition which is selected from the group consisting of N,N-diethyl-m-toluamide, a non-aqueous composition and mixtures thereof. The non-aqueous composition comprises an intimate mixture of an active component and an oily component, where in the active component comprises:

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wherein R<sup>1</sup> and R<sup>2</sup> are independently selected from saturated, straight or branched alkyl group of from 1 to about 10 carbons. In the above formula, R<sup>1</sup> and R<sup>2</sup> are preferably  
5 independently selected from saturated, straight alkyl groups of from 1 to about 3 carbons. More preferably, R<sup>1</sup> is methyl and R<sup>2</sup> is methyl, ethyl, or propyl. In one embodiment, the active component can be derived by a method described in Chinese patent application No. 94100746, Hanzhi et al., filed on July 26, 1995. Such compounds include d-8-acetoxycarvotanacetone (d-8-ACA). Both d-8-ACA and N,N-diethyl-m-toluamide are  
10 referred to herein as the "active components". N,N-diethyl-m-toluamide is a widely used insect repellent active, sometimes referred to as "DEET." See U.S. Patent 2,932,665, Wagner et al, issued on April 12, 1960, U.S. Patent 4,756,905, Melnik, issued July 12, 1988, U.S. Patent 4,416,881, McGovern et al, and U.S. Patent 4,419,360, Smolanoff, which disclose DEET as a repellent for insects.

15 The active component of the present invention provides strong insect and arachnid repellency. Specifically, this class of compounds are particularly effective in repelling dust mites, which are members of the arachnid family and often are unaffected by traditional insect repellent compositions. It is well known that dust mites are a common source of allergens. As such, it is desirable to repel dust mites from areas that are used by  
20 people who are sensitive to allergens. These areas include households, automobiles, offices and other areas. Thus, the compositions of this invention can be applied to a multitude of surfaces that might contain dust mites, other arachnids, and insects, rendering these surfaces relatively free of these potentially noxious pests.

This active component can also provide desirable mite repellency and/or attracting  
25 and trapping efficacy instead of killing mites. It is also believed that the dead mites of the house dust variety float in the air, causing bronchial asthma, allergic dermatitis, and various other disorders. Such repellency and attractant of mites are important for the people having allergic dermatitis. The active components of the present invention are

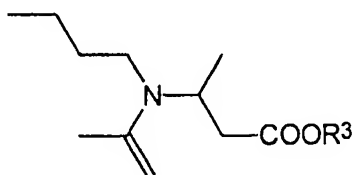
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effective repelling most mites that are commonly found in a household environment, such as *Dermatophagoides farinae* and *Tyrophagus pyrescentiae*.

The compositions of the present invention can preferably comprise "additional active components". It is especially preferred that the additional actives fall within the class of oily compounds. But it is understood that the additional active components can be any appropriate compound that is compatible with the other compounds in the present compositions. Especially preferred additional active components are those of the general structure:



Wherein R3 is hydrogen or  $-(CH_2)_nCH_3$  and n is integer from about 0 to about 10. Such compounds include 3-n-butyl-n-acetyl aminopropionic acid and its ester. These compounds are sold by Merck Chemical Company under the trade name Merck 3535.

Other additional active components for use in the present invention include insect and moth repelling agents such as anti-aggregation pheromones, and other natural and/or synthetic ingredients. Preferred additional active components useful in the composition of the present invention are perfume ingredients, such as citronellol, citronellal, citral, linalool, cedar extract, geranium oil, sandalwood oil, 2-(diethylphenoxy)ethanol, 1-dodecene, etc. Other examples of additional active components useful in the composition of the present invention are disclosed in U.S. Pat. Nos. 4,449,987, 4,693,890, 4,696,676, 4,933,371, 5,030,660, 5,196,200, and in "Semio Activity of Flavor and Fragrance Molecules on Various Insect Species", B.D. Mookherjee et al., published in Bioactive Volatile Compounds from Plants, ASC Symposium Series 525, R. Teranishi, R.G. Buttery, and H. Sugisawa, 1993, pp. 35-48, all of said patents and publications being incorporated herein by reference.

The active component is preferably present at a level of from about 0.01% to about 8%, more preferably, from about 0.03% to about 5%, and even more preferably, from about 0.05% to about 1%, by weight of the composition.



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*OILY COMPONENT*

The active components identified above are most effective when in a liquid state. But when these compounds are dissolved in water and applied to a surface, the water evaporates and the active component tends to crystallize, rendering it relatively ineffective as an insect or dust mite repellent. The compositions of the present invention are not only aqueous based, but they are generally formulated to dry quickly. Thus, the active components of this invention are preferably dissolved in an oily compound before they are added to the compositions of the present invention. In this manner, when the aqueous carrier of the present compositions evaporates, the mixture of the oily compound and the active component remains behind. And the active component remains in its most active state, that is, the liquid state.

Thus, the active component defined above is preferably predissolved in an oily compound. Providing the active component in an oily matrix insures that when the aqueous carrier of the present compositions evaporate, the active component remains in a liquid state. Oily components useful herein can be derived from animals, plants, or petroleum and may be natural or man-made. The oily component is substantially water-insoluble, more preferably essentially water-insoluble. Preferably, the oily components used herein have a melting point of about 50°C or less at atmospheric pressure.

A wide variety of suitable oily components are known and may be used herein. Nonlimiting examples of suitable oily component include those selected from the group consisting of mineral oil, petrolatum, straight and branched chain hydrocarbons having from about 7 to about 40 of carbon atoms, vegetable oils and hydrogenated vegetable oils, animal fats and oils, alcohol esters of carboxylic acids and of dicarboxylic acids, alkylene glycol esters, and mono- and poly- esters of sugars and related materials. While these compounds are well known to those skilled in the art, they are further defined below.

Mineral oil, which is also known as petrolatum liquid, is a mixture of liquid hydrocarbons obtained from petroleum. See The Merck Index, Tenth Edition, Entry 7048, p. 1033 (1983) and International Cosmetic Ingredient Dictionary, Fifth Edition, vol. 1, p.415-417 (1993), which are incorporated by reference herein in their entirety.

Petrolatum, which is also known as petroleum jelly, is a colloidal system of nonstraight-chain solid hydrocarbons and high-boiling liquid hydrocarbons, in which most of the liquid hydrocarbons are held inside the micelles. See The Merck Index, Tenth

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Edition, Entry 7047, p. 1033 (1983); Schindler, Drug. Cosmet. Ind., 89, 36-37, 76, 78-80, 82 (1961); and International Cosmetic Ingredient Dictionary, Fifth Edition, vol. 1, p. 537 (1993), which are incorporated by reference herein in their entirety.

5     Straight and branched chain hydrocarbons having from about 7 to about 40 carbon atoms. Nonlimiting examples of these hydrocarbon materials include dodecane, isododecane, squalane, cholesterol, hydrogenated polyisobutylene, docosane (*i.e.* a C<sub>22</sub> hydrocarbon), hexadecane, isohexadecane (a commercially available hydrocarbon sold as Permethyl® 101A by Presperse, South Plainfield, NJ). Also useful are the C7-C40 isoparaffins, which are C7-C40 branched hydrocarbons.

10     Vegetable oils and hydrogenated vegetable oils. Examples of vegetable oils and hydrogenated vegetable oils include safflower oil, castor oil, coconut oil, cottonseed oil, menhaden oil, palm kernel oil, palm oil, peanut oil, soybean oil, rapeseed oil, linseed oil, rice bran oil, pine oil, sesame oil, sunflower seed oil, hydrogenated safflower oil, hydrogenated castor oil, hydrogenated coconut oil, hydrogenated cottonseed oil,  
15     hydrogenated menhaden oil, hydrogenated palm kernel oil, hydrogenated palm oil, hydrogenated peanut oil, hydrogenated soybean oil, hydrogenated rapeseed oil, hydrogenated linseed oil, hydrogenated rice bran oil, hydrogenated sesame oil, hydrogenated sunflower seed oil, and mixtures thereof.

20     Animal fats and oils Examples of these compounds include lanolin and derivatives thereof, cod liver oil.

25     C<sub>1-30</sub> alcohol esters of C<sub>1-30</sub> carboxylic acids and of C<sub>2-30</sub> dicarboxylic acids These compounds include straight and branched chain materials as well as aromatic derivatives (as used herein in reference to the hydrophobic component, mono- and polycarboxylic acids include straight chain, branched chain and aryl carboxylic acids).  
30     Nonlimiting examples include diisopropyl sebacate, diisopropyl adipate, isopropyl myristate, isopropyl palmitate, methyl palmitate, myristyl propionate, 2-ethylhexyl palmitate, isodecyl neopentanoate, di-2-ethylhexyl maleate, cetyl palmitate, myristyl myristate, stearyl stearate, isopropyl stearate, methyl stearate, cetyl stearate, behenyl behenate, dioctyl maleate, dioctyl sebacate, diisopropyl adipate, cetyl octanoate, diisopropyl dilinoleate.

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Alkylene glycol esters of C<sub>1-30</sub> carboxylic acids Examples of these compounds include ethylene glycol mono- and di- esters, and propylene glycol mono- and di- esters of C<sub>1-30</sub> carboxylic acids e.g., ethylene glycol distearate.

C<sub>1-30</sub> mono- and poly- esters of sugars and related materials These esters are  
5 derived from a sugar or polyol moiety and one or more carboxylic acid moieties. Depending on the constituent acid and sugar, these esters can be in either liquid or solid form at room temperature. Examples of liquid esters include: glucose tetraoleate, the glucose tetraesters of soybean oil fatty acids (unsaturated), the mannose tetraesters of mixed soybean oil fatty acids, the galactose tetraesters of oleic acid, the arabinose  
10 tetraesters of linoleic acid, xylose tetralinoleate, galactose pentaoleate, sorbitol tetraoleate, the sorbitol hexaesters of unsaturated soybean oil fatty acids, xylitol pentaoleate, sucrose tetraoleate, sucrose pentaoleate, sucrose hexaoleate, sucrose heptaoleate, sucrose octaoleate, and mixtures thereof. Examples of solid esters include: sorbitol hexaester in which the carboxylic acid ester moieties are palmitoleate and arachidate in a 1:2 molar  
15 ratio; the octaester of raffinose in which the carboxylic acid ester moieties are linoleate and behenate in a 1:3 molar ratio; the heptaester of maltose wherein the esterifying carboxylic acid moieties are sunflower seed oil fatty acids and lignocerate in a 3:4 molar ratio; the octaester of sucrose wherein the esterifying carboxylic acid moieties are oleate and behenate in a 2:6 molar ratio; and the octaester of sucrose wherein the esterifying  
20 carboxylic acid moieties are laurate, linoleate and behenate in a 1:3:4 molar ratio. A preferred solid material is sucrose polyester in which the degree of esterification is 7-8, and in which the fatty acid moieties are C<sub>18</sub> mono- and/or di-unsaturated and behenic, in a molar ratio of unsaturates:behenic of 1:7 to 3:5. A particularly preferred solid sugar polyester is the octaester of sucrose in which there are about 7 behenic fatty acid moieties  
25 and about 1 oleic acid moiety in the molecule. Other materials include cottonseed oil or soybean oil fatty acid esters of sucrose. The ester materials are further described in, U.S. Patent No. 2,831,854, U.S. Patent No. 4,005,196, to Jandacek, issued January 25, 1977; U.S. Patent No. 4,005,195, to Jandacek, issued January 25, 1977, U.S. Patent No. 5,306,516, to Letton et al., issued April 26, 1994; U.S. Patent No. 5,306,515, to Letton et  
30 al., issued April 26, 1994; U.S. Patent No. 5,305,514, to Letton et al., issued April 26, 1994; U.S. Patent No. 4,797,300, to Jandacek et al., issued January 10, 1989; U.S. Patent No. 3,963,699, to Rizzi et al, issued June 15, 1976; U.S. Patent No. 4,518,772, to

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Volpenhein, issued May 21, 1985; and U.S. Patent No. 4,517,360, to Volpenhein, issued May 21, 1985; all of which are incorporated by reference herein in their entirety.

The compositions of the present invention can contain from about 0.1% to about 10.0%, preferably from about 0.3% to about 8.0%, and more preferably from about 0.5%  
5 to about 7.0% by weight of the composition, of the oily component.

### *CYCLODEXTRIN*

As used herein, the term "cyclodextrin" includes any of the known cyclodextrins such as unsubstituted cyclodextrins containing from six to twelve glucose units, especially,  
10 alpha-cyclodextrin, beta-cyclodextrin, gamma-cyclodextrin and/or their derivatives and/or mixtures thereof. The alpha-cyclodextrin consists of six glucose units, the beta-cyclodextrin consists of seven glucose units, and the gamma-cyclodextrin consists of eight glucose units arranged in donut-shaped rings. The specific coupling and conformation of the glucose units give the cyclodextrins a rigid, conical molecular structures with hollow  
15 interiors of specific volumes. The "lining" of each internal cavity is formed by hydrogen atoms and glycosidic bridging oxygen atoms; therefore, this surface is fairly hydrophobic. The unique shape and physical-chemical properties of the cavity enable the cyclodextrin molecules to absorb (form inclusion complexes with) organic molecules or parts of organic molecules which can fit into the cavity. Many odorous molecules can fit into the  
20 cavity including many malodorous molecules and perfume molecules. Therefore, cyclodextrins, and especially mixtures of cyclodextrins with different size cavities, can be used to control odors caused by a broad spectrum of organic odoriferous materials, which may, or may not, contain reactive functional groups. The complexation between cyclodextrin and odorous molecules occurs rapidly in the presence of water. However, the  
25 extent of the complex formation also depends on the polarity of the absorbed molecules. In an aqueous solution, strongly hydrophilic molecules (those which are highly water-soluble) are only partially absorbed, if at all. Therefore, cyclodextrin does not complex effectively with some very low molecular weight organic amines and acids when they are present at low levels on wet fabrics. As the water is being removed however, e.g., the  
30 fabric is being dried off, some low molecular weight organic amines and acids have more affinity and will complex with the cyclodextrins more readily.

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The cavities within the cyclodextrin in the solution of the present invention should remain essentially unfilled (the cyclodextrin remains uncomplexed) while in solution, in order to allow the cyclodextrin to absorb various odor molecules when the solution is applied to a surface. Non-derivatised (normal) beta-cyclodextrin can be present at a level  
5 up to its solubility limit of about 1.85% (about 1.85g in 100 grams of water) at room temperature. Beta-cyclodextrin is not preferred in compositions which call for a level of cyclodextrin higher than its water solubility limit. Non-derivatised beta-cyclodextrin is generally not preferred when the composition contains surfactant since it affects the surface activity of most of the preferred surfactants that are compatible with the  
10 derivatized cyclodextrins.

Preferably, the odor absorbing solution of the present invention is clear. The term "clear" as defined herein means transparent or translucent, preferably transparent, as in "water clear," when observed through a layer having a thickness of less than about 10 cm.

Preferably, the cyclodextrins used in the present invention are highly water-soluble  
15 such as, alpha-cyclodextrin and/or derivatives thereof, gamma-cyclodextrin and/or derivatives thereof, derivatised beta-cyclodextrins, and/or mixtures thereof. The derivatives of cyclodextrin consist mainly of molecules wherein some of the OH groups are converted to OR groups. Cyclodextrin derivatives include, e.g., those with short chain alkyl groups such as methylated cyclodextrins, and ethylated cyclodextrins, wherein R is a  
20 methyl or an ethyl group; those with hydroxyalkyl substituted groups, such as hydroxypropyl cyclodextrins and/or hydroxyethyl cyclodextrins, wherein R is a -CH<sub>2</sub>-CH(OH)-CH<sub>3</sub> or a -CH<sub>2</sub>CH<sub>2</sub>-OH group; branched cyclodextrins such as maltose-bonded cyclodextrins; cationic cyclodextrins such as those containing 2-hydroxy-3-(dimethylamino)propyl ether, wherein R is CH<sub>2</sub>-CH(OH)-CH<sub>2</sub>-N(CH<sub>3</sub>)<sub>2</sub> which is cationic  
25 at low pH; quaternary ammonium, e.g., 2-hydroxy-3-(trimethylammonio)propyl ether chloride groups, wherein R is CH<sub>2</sub>-CH(OH)-CH<sub>2</sub>-N<sup>+</sup>(CH<sub>3</sub>)<sub>3</sub>Cl<sup>-</sup>; anionic cyclodextrins such as carboxymethyl cyclodextrins, cyclodextrin sulfates, and cyclodextrin succinylates; amphoteric cyclodextrins such as carboxymethyl/quaternary ammonium cyclodextrins; cyclodextrins wherein at least one glucopyranose unit has a 3-6-anhydro-cyclomalto  
30 structure, e.g., the mono-3-6-anhydrocyclodextrins, as disclosed in "Optimal Performances with Minimal Chemical Modification of Cyclodextrins", F. Diedaini-Pilard and B. Perly, The 7th International Cyclodextrin Symposium Abstracts, April 1994, p. 49, said

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references being incorporated herein by reference; and mixtures thereof. Other cyclodextrin derivatives are disclosed in U.S. Pat. Nos: 3,426,011, Parmerter et al., issued Feb. 4, 1969; 3,453,257; 3,453,258; 3,453,259; and 3,453,260, all in the names of Parmerter et al., and all issued July 1, 1969; 3,459,731, Gramera et al., issued Aug. 5, 1969; 3,553,191, Parmerter et al., issued Jan. 5, 1971; 3,565,887, Parmerter et al., issued Feb. 23, 1971; 4,535,152, Szejtli et al., issued Aug. 13, 1985; 4,616,008, Hirai et al., issued Oct. 7, 1986; 4,678,598, Ogino et al., issued Jul. 7, 1987; 4,638,058, Brandt et al., issued Jan. 20, 1987; and 4,746,734, Tsuchiyama et al., issued May 24, 1988; all of said patents being incorporated herein by reference.

10 Highly water-soluble cyclodextrins are those having water solubility of at least about 10 g in 100 ml of water at room temperature, preferably at least about 20 g in 100 ml of water, more preferably at least about 25 g in 100 ml of water at room temperature. The availability of solubilized, uncomplexed cyclodextrins is essential for effective and efficient odor control performance. Solubilized, water-soluble cyclodextrin can exhibit  
15 more efficient odor control performance than non-water-soluble cyclodextrin when deposited onto surfaces, especially fabric.

Examples of preferred water-soluble cyclodextrin derivatives suitable for use herein are hydroxypropyl alpha-cyclodextrin, methylated alpha-cyclodextrin, methylated beta-cyclodextrin, hydroxyethyl beta-cyclodextrin, and hydroxypropyl beta-cyclodextrin.  
20 Hydroxyalkyl cyclodextrin derivatives preferably have a degree of substitution of from about 1 to about 14, more preferably from about 1.5 to about 7, wherein the total number of OR groups per cyclodextrin is defined as the degree of substitution. Methylated cyclodextrin derivatives typically have a degree of substitution of from about 1 to about 18, preferably from about 3 to about 16. A known methylated beta-cyclodextrin is  
25 heptakis-2,6-di-O-methyl- $\beta$ -cyclodextrin, commonly known as DIMEB, in which each glucose unit has about 2 methyl groups with a degree of substitution of about 14. A preferred, more commercially available, methylated beta-cyclodextrin is a randomly methylated beta-cyclodextrin, commonly known as RAMEB, having different degrees of substitution, normally of about 12.6. RAMEB is more preferred than DIMEB, since  
30 DIMEB affects the surface activity of the preferred surfactants more than RAMEB. The preferred cyclodextrins are available, e.g., from Cerestar USA, Inc. and Wacker Chemicals (USA), Inc.

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It is also preferable to use a mixture of cyclodextrins. Such mixtures absorb odors more broadly by complexing with a wider range of odoriferous molecules having a wider range of molecular sizes. Preferably at least a portion of the cyclodextrins is alpha-cyclodextrin and its derivatives thereof, gamma-cyclodextrin and its derivatives thereof, and/or derivatised beta-cyclodextrin, more preferably a mixture of alpha-cyclodextrin, or an alpha-cyclodextrin derivative, and derivatised beta-cyclodextrin, even more preferably a mixture of derivatised alpha-cyclodextrin and derivatised beta-cyclodextrin, most preferably a mixture of hydroxypropyl alpha-cyclodextrin and hydroxypropyl beta-cyclodextrin, and/or a mixture of methylated alpha-cyclodextrin and methylated beta-cyclodextrin.

For controlling odor on fabrics, the composition is preferably used as a spray. It is preferable that the usage compositions of the present invention contain low levels of cyclodextrin so that a visible stain does not appear on the fabric at normal usage levels. Preferably, the solution used to treat the surface under usage conditions is virtually not discernible when dry. Typical levels of cyclodextrin in usage compositions for usage conditions are from about 0.01% to about 5%, preferably from about 0.1% to about 4%, more preferably from about 0.5% to about 2% by weight of the composition. Compositions with higher concentrations can leave unacceptable visible stains on fabrics as the solution evaporates off of the fabric. This is especially a problem on thin, colored, synthetic fabrics. In order to avoid or minimize the occurrence of fabric staining, it is preferable that the fabric be treated at a level of less than about 5 mg of cyclodextrin per gram of fabric, more preferably less than about 2 mg of cyclodextrin per gram of fabric. The presence of the surfactant can improve appearance by minimizing localized spotting.

Concentrated compositions can also be used in order to deliver a less expensive product. When a concentrated product is used, i.e., when the level of cyclodextrin used is from about 3% to about 20%, more preferably from about 5% to about 10%, by weight of the concentrated composition, it is preferable to dilute the concentrated composition before treating fabrics in order to avoid staining. Preferably the concentrated cyclodextrin composition is diluted with about 50% to about 6000%, more preferably with about 75% to about 2000%, most preferably with about 100% to about 1000% by weight of the concentrated composition of water. The resulting diluted compositions have usage

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concentrations of cyclodextrin as discussed hereinbefore, e.g., of from about 0.1% to about 5%, by weight of the diluted composition.

#### *LOW MOLECULAR WEIGHT ALCOHOLS*

5 Low molecular weight alcohols with relatively low boiling points, as compared to water, such as methanol, ethanol, propanol and butanol, are preferred optional ingredients for improving the drying speed of the present compositions. Specifically, when the aqueous based compositions of this invention are sprayed on a solid surface, the surface necessarily becomes wet. Consumers, in general, do not like having wet counter tops,  
10 furniture, car interior's and other common surfaces. Thus, for consumer acceptance, it is preferred that the compositions herein dry quickly after being applied to a surface. The addition of a low molecular weight alcohol substantially improves the drying time of the present compositions.

Typically, alcohol is added to the composition of the present invention at a level of  
15 from about 0.01% to about 30%, by weight of the composition, preferably from about 0.05% to about 10%, more preferably from about 0.1% to about 5.0%, by weight of the composition.

#### *SURFACTANT OR EMULSIFIER*

20 It is preferred that the compositions of the present invention include a surfactant or an emulsifier to emulsify the mixture of the oily compound and the active component in the aqueous carrier. Most preferably, the surfactant or emulsifier is fully compatible with the cyclodextrin, the active component and the optional ingredients. In addition to suspending the oily mixture in the aqueous carrier, the compatible surfactant or emulsifier  
25 provides a low surface tension that permits the composition to spread readily and more uniformly on hydrophobic surfaces like polyester and nylon. It has been found that the aqueous solution, without such a surfactant or emulsifier will not spread satisfactorily. The spreading of the composition also allows it to dry faster, so that the treated material is ready to use sooner. Furthermore, the composition containing a compatible surfactant or  
30 emulsifier can penetrate hydrophobic, oily soil better for improved malodor control. The composition containing a compatible surfactant or emulsifier also provides improved "in-wear" electrostatic control. For concentrated compositions, the surfactant or emulsifier



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facilitates the dispersion of many actives such as antimicrobial actives and perfumes in the concentrated aqueous compositions.

The compatible surfactant or emulsifier for use in providing the required low surface tension in the composition of the present invention should be cyclodextrin-compatible, that is it should not substantially form a complex with the cyclodextrin so as to diminish performance of the cyclodextrin and/or the surfactant. Complex formation diminishes both the ability of the cyclodextrin to absorb odors and the ability of the surfactant to lower the surface tension of the aqueous composition.

Suitable compatible surfactants can be readily identified by the absence of effect of cyclodextrin on the surface tension provided by the surfactant. This is achieved by determining the surface tension (in dyne/cm<sup>2</sup>) of aqueous solutions of the surfactant in the presence and in the absence of about 1% of a specific cyclodextrin in the solutions. The aqueous solutions contain surfactant at concentrations of approximately 0.5%, 0.1%, 0.01%, and 0.005%. The cyclodextrin can affect the surface activity of a surfactant by elevating the surface tension of the surfactant solution. If the surface tension at a given concentration in water differs by more than about 10% from the surface tension of the same surfactant in the 1% solution of the cyclodextrin, that is an indication of a strong interaction between the surfactant and the cyclodextrin. The preferred surfactants herein should have a surface tension in an aqueous solution that is different (lower) by less than about 10%, preferably less than about 5%, and more preferably less than about 1% from that of the same concentration solution containing 1% cyclodextrin.

Nonlimiting examples of compatible nonionic surfactants include block copolymers of ethylene oxide and propylene oxide. Suitable block polyoxyethylene-polyoxypropylene polymeric surfactants, that are compatible with most cyclodextrins, include those based on ethylene glycol, propylene glycol, glycerol, trimethylolpropane and ethylenediamine as the initial reactive hydrogen compound. Polymeric compounds made from a sequential ethoxylation and propoxylation of initial compounds with a single reactive hydrogen atom, such as C<sub>12-18</sub> aliphatic alcohols, are not generally compatible with the cyclodextrin. Certain of the block polymer surfactant compounds designated Pluronic<sup>®</sup> and Tetronic<sup>®</sup> by the BASF-Wyandotte Corp., Wyandotte, Michigan, are readily available.

Nonlimiting examples of cyclodextrin-compatible surfactants of this type include:

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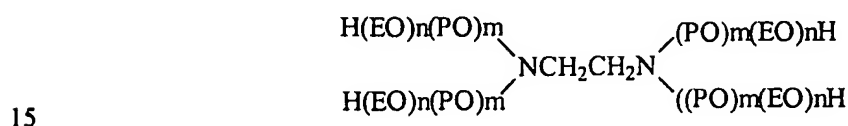
Pluronic Surfactants with the general formula  $H(EO)_n(PO)_m(EO)_nH$ ,

wherein EO is an ethylene oxide group, PO is a propylene oxide group, and n and m are numbers that indicate the average number of the groups in the surfactants. Typical examples of cyclodextrin-compatible Pluronic surfactants are:

5	Name	Average MW	Average n	Average m
	L-101	3,800	4	59
	L-81	2,750	3	42
	L-44	2,200	10	23
	L-43	1,850	6	22
10	F-38	4,700	43	16
	P-84	4,200	19	43,

and mixtures thereof.

Tetronic Surfactants with the general formula:



wherein EO, PO, n, and m have the same meanings as above. Typical examples of cyclodextrin-compatible Tetronic surfactants are:

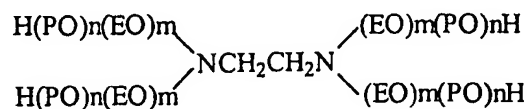
	Name	Average MW	Average n	Average m
20	901	4,700	3	18
	908	25,000	114	22,

and mixtures thereof.

"Reverse" Pluronic and Tetronic surfactants have the following general formulas:

Reverse Pluronic Surfactants  $H(PO)_m(EO)_n(PO)_mH$

25 Reverse Tetronic Surfactants



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wherein EO, PO, n, and m have the same meanings as above. Typical examples of cyclodextrin-compatible Reverse Pluronic and Reverse Tetronic surfactants are:

Reverse Pluronic surfactants:

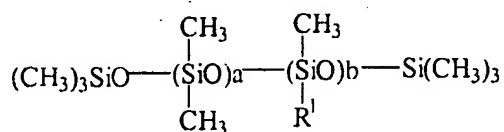
	Name	Average MW	Average n	Average m
5	10 R5	1,950	8	22
	25 R1	2,700	21	6

Reverse Tetronic surfactants

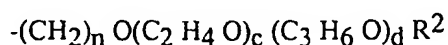
	Name	Average MW	Average n	Average m
	130 R2	7,740	9	26
10	70 R2	3,870	4	13

and mixtures thereof.

A preferred class of cyclodextrin-compatible nonionic surfactants are the polyalkyleneoxide polysiloxanes having a dimethyl polysiloxane hydrophobic moiety and one or more hydrophilic polyalkylene side chains. Examples of this type of surfactants are the Silwet<sup>®</sup> surfactants which are available OSi Specialties, Inc., Danbury, Connecticut, and have the general formula:



wherein a + b are from about 1 to about 50, preferably from about 3 to about 30, more preferably from about 10 to about 25, and R<sup>1</sup> is mainly one or more random poly(ethyleneoxide/propyleneoxide) copolymer groups having the general formula:



wherein n is 3 or 4, preferably 3; total c (for all polyalkyleneoxy side groups) has a value of from 1 to about 100, preferably from about 6 to about 100; total d is from 0 to about 14, preferably from 0 to about 3; and more preferably d is 0; total c+d has a value of from about 5 to about 150, preferably from about 9 to about 100 and each R<sup>2</sup> is the same or different and is selected from the group consisting of hydrogen, an alkyl having 1 to 4 carbon atoms, and an acetyl group, preferably hydrogen and methyl group.

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Representative Silwet surfactants are as follows.

Name	Average MW	Average a+b	Average total c
L-7608	600	1	9
L-7607	1,000	2	17
5 L-77	600	1	9
L-7605	6,000	20	99
L-7604	4,000	21	53
L-7600	4,000	11	68
L-7657	5,000	20	76
10 L-7602	3,000	20	29

The molecular weight of the polyalkyleneoxy group ( $R^1$ ) is less than or equal to about 10,000. Preferably, the molecular weight of the polyalkyleneoxy group is less than or equal to about 8,000, and most preferably ranges from about 300 to about 5,000. Thus, the values of c and d can be those numbers which provide molecular weights within these

15 ranges. However, the number of ethyleneoxy units ( $-C_2H_4O$ ) in the polyether chain ( $R^1$ ) must be sufficient to render the polyalkyleneoxide polysiloxane water dispersible or water soluble. If propyleneoxy groups are present in the polyalkyleneoxy chain, they can be distributed randomly in the chain or exist as blocks. Preferred Silwet surfactants are L-7600, L-7602, L-7604, L-7605, L-7657, and mixtures thereof. Besides surface activity,

20 polyalkyleneoxide polysiloxane surfactants can also provide other benefits, such as antistatic benefits, lubricity and softness to fabrics.

The preparation of polyalkyleneoxide polysiloxanes is well known in the art. Polyalkyleneoxide polysiloxanes of the present invention can be prepared according to the procedure set forth in U.S. Pat. No. 3,299,112, incorporated herein by reference.

25 Typically, polyalkyleneoxide polysiloxanes of the surfactant blend of the present invention are readily prepared by an addition reaction between a hydrosiloxane (i.e., a siloxane containing silicon-bonded hydrogen) and an alkenyl ether (e.g., a vinyl, allyl, or methallyl ether) of an alkoxy or hydroxy end-blocked polyalkylene oxide). The reaction conditions employed in addition reactions of this type are well known in the art and in general

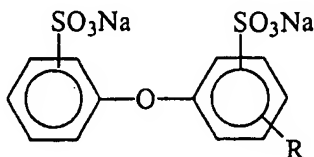
30 involve heating the reactants (e.g., at a temperature of from about 85° C. to 110° C.) in the presence of a platinum catalyst (e.g., chloroplatinic acid) and a solvent (e.g., toluene).

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Nonlimiting examples of compatible anionic surfactants are the alkyldiphenyl oxide disulfonate, having the general formula:



wherein R is an alkyl group. Examples of this type of surfactants are available from the  
5 Dow Chemical Company under the trade name Dowfax<sup>®</sup> wherein R is a linear or  
branched  $\text{C}_6\text{-C}_{16}$  alkyl group. An example of these cyclodextrin-compatible anionic  
surfactant is Dowfax 3B2 with R being approximately a linear  $\text{C}_{10}$  group. These anionic  
surfactants are preferably not used when the antimicrobial active or preservative, etc., is  
cationic to minimize the interaction with the cationic actives, since the effect of both  
10 surfactant and active are diminished.

The surfactants above are either weakly interactive with cyclodextrin (less than 5%  
elevation in surface tension, or non-interactive (less than 1% elevation in surface tension).  
Normal surfactants like sodium dodecyl sulfate and dodecanolpoly(6)ethoxylate are  
strongly interactive, with more than a 10% elevation in surface tension in the presence of a  
15 typical cyclodextrin like hydroxypropylbeta-cyclodextrin and methylated beta-  
cyclodextrin.

Typical levels of cyclodextrin-compatible surfactants in usage compositions are  
from about 0.01% to about 2%, preferably from about 0.03% to about 0.6%, more  
preferably from about 0.05% to about 0.3%, by weight of the composition. Typical levels  
20 of cyclodextrin-compatible surfactants in concentrated compositions are from about 0.1%  
to about 8%, preferably from about 0.2% to about 4%, more preferably from about 0.3% to  
about 3%, by weight of the concentrated composition.

#### *LOW MOLECULAR WEIGHT POLYOLS*

25 Low molecular weight polyols with relatively high boiling points, as compared to  
water, such as ethylene glycol, propylene glycol and/or glycerol are preferred optional  
ingredients for improving odor control performance of the composition of the present

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invention. Not to be bound by theory, it is believed that the incorporation of a small amount of low molecular weight glycols into the composition of the present invention enhances the formation of the cyclodextrin inclusion complexes as the fabric dries.

It is believed that the polyols' ability to remain on the fabric for a longer period of time than water, as the fabric dries allows it to form ternary complexes with the cyclodextrin and some malodorous molecules. The addition of the glycols is believed to fill up void space in the cyclodextrin cavity that is unable to be filled by some malodorous molecules of relatively smaller sizes. Preferably the glycol used is glycerine, ethylene glycol, propylene glycol, dipropylene glycol or mixtures thereof, more preferably ethylene glycol and propylene glycol. Cyclodextrins prepared by processes that result in a level of such polyols are highly desirable, since they can be used without removal of the polyols.

Some polyols, e.g., dipropylene glycol, are also useful to facilitate the solubilization of some perfume ingredients in the composition of the present invention.

Typically, glycol is added to the composition of the present invention at a level of from about 0.01% to about 3%, by weight of the composition, preferably from about 0.05% to about 1%, more preferably from about 0.1% to about 0.5%, by weight of the composition. The preferred weight ratio of low molecular weight polyol to cyclodextrin is from about 2:1,000 to about 20:100, more preferably from about 3:1,000 to about 15:100, even more preferably from about 5:1,000 to about 10:100, and most preferably from about 1:100 to about 7:100.

#### *ANTIMICROBIAL ACTIVE*

An optional, but preferred ingredient of the present invention includes a water-soluble antimicrobial active, which is useful in providing protection against organisms that become attached to the treated material. The antimicrobial should be cyclodextrin-compatible, e.g., not substantially forming complexes with the cyclodextrin in the odor absorbing composition. It should also be compatible with the active components and the optional compounds. The free, uncomplexed antimicrobial, e.g., antibacterial, active provides an optimum antibacterial performance.

Sanitization of fabrics can be achieved by the compositions of the present invention containing, antimicrobial materials, e.g., antibacterial halogenated compounds, quaternary compounds, and phenolic compounds.

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Biguanides. Some of the more robust cyclodextrin-compatible antimicrobial halogenated compounds which can function as disinfectants/sanitizers as well as finish product preservatives (vide infra), and are useful in the compositions of the present invention include 1,1'-hexamethylene bis(5-(p-chlorophenyl)biguanide), commonly known  
 5 as chlorhexidine, and its salts, e.g., with hydrochloric, acetic and gluconic acids. The digluconate salt is highly water-soluble, about 70% in water, and the diacetate salt has a solubility of about 1.8% in water. When chlorhexidine is used as a sanitizer in the present invention it is typically present at a level of from about 0.001% to about 0.4%, preferably from about 0.002% to about 0.3%, and more preferably from about 0.05% to about 0.2%,  
 10 by weight of the usage composition. In some cases, a level of from about 1% to about 2% may be needed for virucidal activity.

Other useful biguanide compounds include Cosmoci® CQ®, Vantocil® IB, including poly (hexamethylene biguanide) hydrochloride. Other useful cationic antimicrobial agents include the bis-biguanide alkanes. Usable water soluble salts of the  
 15 above are chlorides, bromides, sulfates, alkyl sulfonates such as methyl sulfonate and ethyl sulfonate, phenylsulfonates such as p-methylphenyl sulfonates, nitrates, acetates, gluconates, and the like.

Examples of suitable bis biguanide compounds are chlorhexidine; 1,6-bis-(2-ethylhexylbiguanidohexane)dihydrochloride; 1,6-di-(N<sub>1</sub>,N<sub>1</sub>'-phenyldiguanido-N<sub>5</sub>,N<sub>5</sub>')-  
 20 hexane tetrahydrochloride; 1,6-di-(N<sub>1</sub>,N<sub>1</sub>'-phenyl-N<sub>1</sub>,N<sub>1</sub>'-methyldiguanido-N<sub>5</sub>,N<sub>5</sub>')-hexane dihydrochloride; 1,6-di(N<sub>1</sub>,N<sub>1</sub>'-o-chlorophenyldiguanido-N<sub>5</sub>,N<sub>5</sub>')-hexane dihydrochloride; 1,6-di(N<sub>1</sub>,N<sub>1</sub>'-2,6-dichlorophenyldiguanido-N<sub>5</sub>,N<sub>5</sub>')hexane dihydrochloride; 1,6-di[N<sub>1</sub>,N<sub>1</sub>'-.beta.-(p-methoxyphenyl) diguanido-N<sub>5</sub>,N<sub>5</sub>']-hexane dihydrochloride; 1,6-di(N<sub>1</sub>,N<sub>1</sub>'-.alpha.-methyl-.beta.-phenyldiguanido-N<sub>5</sub>,N<sub>5</sub>')-hexane  
 25 dihydrochloride; 1,6-di(N<sub>1</sub>,N<sub>1</sub>'-p-nitrophenyldiguanido-N<sub>5</sub>,N<sub>5</sub>')hexane dihydrochloride; omega.:omega'-di-(N<sub>1</sub>,N<sub>1</sub>'-phenyldiguanido-N<sub>5</sub>,N<sub>5</sub>')-di-n-propylether dihydrochloride; omega:omega'-di(N<sub>1</sub>,N<sub>1</sub>'-p-chlorophenyldiguanido-N<sub>5</sub>,N<sub>5</sub>')-di-n-propylether tetrahydrochloride; 1,6-di(N<sub>1</sub>,N<sub>1</sub>'-2,4-dichlorophenyldiguanido-N<sub>5</sub>,N<sub>5</sub>')hexane tetrahydrochloride; 1,6-di(N<sub>1</sub>,N<sub>1</sub>'-p-methylphenyldiguanido-N<sub>5</sub>,N<sub>5</sub>')hexane dihydrochloride; 1,6-di(N<sub>1</sub>,N<sub>1</sub>'-2,4,5-trichlorophenyldiguanido-N<sub>5</sub>,N<sub>5</sub>')hexane tetrahydrochloride; 1,6-di[N<sub>1</sub>,N<sub>1</sub>'-.alpha.-(p-chlorophenyl) ethyldiguanido-N<sub>5</sub>,N<sub>5</sub>'] hexane dihydrochloride; omega.:omega'.di(N<sub>1</sub>, N<sub>1</sub>'-p-chlorophenyldiguanido-

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$N_5,N_5'$ m-xylene dihydrochloride; 1,12-di( $N_1,N_1'$ -p-chlorophenyldiguanido- $N_5,N_5'$ )  
 dodecane dihydrochloride; 1,10-di( $N_1,N_1'$ -phenyldiguanido- $N_5,N_5'$ )-decane  
 tetrahydrochloride; 1,12-di( $N_1,N_1'$ -phenyldiguanido- $N_5,N_5'$ ) dodecane  
 tetrahydrochloride; 1,6-di( $N_1,N_1'$ -o-chlorophenyldiguanido- $N_5,N_5'$ ) hexane  
 5 dihydrochloride; 1,6-di( $N_1,N_1'$ -p-chlorophenyldiguanido- $N_5,N_5'$ )-hexane  
 tetrahydrochloride; ethylene bis (1-tolyl biguanide); ethylene bis (p-tolyl biguanide);  
 ethylene bis(3,5-dimethylphenyl biguanide); ethylene bis(p-tert-amylphenyl biguanide);  
 ethylene bis(nonylphenyl biguanide); ethylene bis (phenyl biguanide); ethylene bis (N-  
 butylphenyl biguanide); ethylene bis (2,5-diethoxyphenyl biguanide); ethylene bis(2,4-  
 10 dimethylphenyl biguanide); ethylene bis(o-diphenylbiguanide); ethylene bis(mixed amyl  
 naphthyl biguanide); N-butyl ethylene bis(phenylbiguanide); trimethylene bis(o-tolyl  
 biguanide); N-butyl trimethylene bis(phenyl biguanide); and the corresponding  
 pharmaceutically acceptable salts of all of the above such as the acetates; gluconates;  
 hydrochlorides; hydrobromides; citrates; bisulfites; fluorides; polymaleates; N-  
 15 coconutalkylsarcosinates; phosphites; hypophosphites; perfluorooctanoates; silicates;  
 sorbates; salicylates; maleates; tartrates; fumarates; ethylenediaminetetraacetates;  
 iminodiacetates; cinnamates; thiocyanates; arginates; pyromellitates;  
 tetracarboxybutyrates; benzoates; glutarates; monofluorophosphates; and  
 perfluoropropionates, and mixtures thereof. Preferred antimicrobials from this group are  
 20 1,6-di( $N_1,N_1'$ -phenyldiguanido- $N_5,N_5'$ )-hexane tetrahydrochloride; 1,6-di( $N_1,N_1'$ -o-  
 chlorophenyldiguanido- $N_5,N_5'$ )-hexane dihydrochloride; 1,6-di( $N_1,N_1'$ -2,6-  
 dichlorophenyldiguanido- $N_5,N_5'$ )-hexane dihydrochloride; 1,6-di( $N_1,N_1'$ -2,4-  
 dichlorophenyldiguanido- $N_5,N_5'$ )-hexane tetrahydrochloride; 1,6-di[ $N_1,N_1'$ -alpha-(p-  
 chlorophenyl) ethyldiguanido- $N_5,N_5'$ ] hexane dihydrochloride; omega.:omega.'di( $N_1$ ,  
 25  $N_1'$ -p-chlorophenyldiguanido- $N_5,N_5'$ )m-xylene dihydrochloride; 1,12-di( $N_1,N_1'$ -p-  
 chlorophenyldiguanido- $N_5,N_5'$ ) dodecane dihydrochloride; 1,6-di( $N_1,N_1'$ -o-  
 chlorophenyldiguanido- $N_5,N_5'$ ) hexane dihydrochloride; 1,6-di( $N_1,N_1'$ -p-  
 chlorophenyldiguanido- $N_5,N_5'$ )-hexane tetrahydrochloride; and mixtures thereof; more  
 preferably, 1,6-di( $N_1,N_1'$ -o-chlorophenyldiguanido- $N_5,N_5'$ )-hexane dihydrochloride; 1,6-  
 30 di( $N_1,N_1'$ -2,6-dichlorophenyldiguanido- $N_5,N_5'$ )-hexane dihydrochloride; 1,6-di( $N_1,N_1'$ -  
 2,4-dichlorophenyldiguanido- $N_5,N_5'$ )-hexane tetrahydrochloride; 1,6-di[ $N_1,N_1'$ -alpha-(p-  
 chlorophenyl) ethyldiguanido- $N_5,N_5'$ ] hexane dihydrochloride; omega.:omega.'di( $N_1$ ,



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N<sub>1</sub>'-p-chlorophenyldiguanido-N<sub>5</sub>,N<sub>5</sub>')m-xylene dihydrochloride; 1,12-di(N<sub>1</sub>,N<sub>1</sub>'-p-chlorophenyldiguanido-N<sub>5</sub>,N<sub>5</sub>') dodecane dihydrochloride; 1,6-di(N<sub>1</sub>,N<sub>1</sub>'-o-chlorophenyldiguanido-N<sub>5</sub>,N<sub>5</sub>') hexane dihydrochloride; 1,6-di(N<sub>1</sub>,N<sub>1</sub>'-p-chlorophenyldiguanido-N<sub>5</sub>,N<sub>5</sub>')-hexane tetrahydrochloride; and mixtures thereof. As  
5 stated hereinbefore, the bis biguanide of choice is chlorhexidine its salts, e.g., digluconate, dihydrochloride, diacetate, and mixtures thereof.

Quaternary Compounds. A wide range of quaternary compounds can also be used as antimicrobial actives, in conjunction with the preferred surfactants, for compositions of the present invention that do not contain cyclodextrin. Non-limiting examples of useful  
10 quaternary compounds include: (1) benzalkonium chlorides and/or substituted benzalkonium chlorides such as commercially available Barquat® (available from Lonza), Maquat® (available from Mason), Variquat® (available from Witco/Sherex), and Hyamine® (available from Lonza); (2) dialkyl quaternary such as Bardac® products of Lonza, (3) N-(3-chloroallyl) hexaminium chlorides such as Dowicide® and Dowicil®  
15 available from Dow; (4) benzethonium chloride such as Hyamine® 1622 from Rohm & Haas; (5) methylbenzethonium chloride represented by Hyamine® 10X supplied by Rohm & Haas, (6) cetylpyridinium chloride such as Cepacol chloride available from Merrell Labs. Typical concentrations for biocidal effectiveness of these quaternary compounds range from about 0.001% to about 0.8%, preferably from about 0.005% to about 0.3%,  
20 more preferably from about 0.01% to 0.2%, by weight of the usage composition. The corresponding concentrations for the concentrated compositions are from about 0.003% to about 2%, preferably from about 0.006% to about 1.2%, and more preferably from about 0.1% to about 0.8% by weight of the concentrated compositions.

The surfactants, when added to the antimicrobials tend to provide improved  
25 antimicrobial action. This is especially true for the siloxane surfactants, and especially when the siloxane surfactants are combined with the chlorhexidine antimicrobial actives.

### PERFUME

The odor absorbing composition of the present invention can also optionally  
30 provide a "scent signal" in the form of a pleasant odor which signals the removal of malodor from fabrics. The scent signal is designed to provide a fleeting perfume scent, and is not designed to be overwhelming or to be used as an odor masking ingredient.

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When perfume is added as a scent signal, it is added only at very low levels, e.g., from about 0% to about 0.5%, preferably from about 0.003% to about 0.3%, more preferably from about 0.005% to about 0.2%, by weight of the usage composition.

Perfume can also be added as a more intense odor in product and on surfaces.

- 5 When stronger levels of perfume are preferred, relatively higher levels of perfume can be added. Any type of perfume can be incorporated into the composition of the present invention. It is essential, however, that the perfume be added at a level wherein even if all of the perfume in the composition were to complex with the cyclodextrin molecules, there will still be an effective level of uncomplexed cyclodextrin molecules present in the
- 10 solution to provide adequate odor control. In order to reserve an effective amount of cyclodextrin molecules for odor control, perfume is typically present at a level wherein less than about 90% of the cyclodextrin complexes with the perfume, preferably less than about 50% of the cyclodextrin complexes with the perfume, more preferably, less than about 30% of the cyclodextrin complexes with the perfume, and most preferably, less than
- 15 about 10% of the cyclodextrin complexes with the perfume. The cyclodextrin to perfume weight ratio should be greater than about 8:1, preferably greater than about 10:1, more preferably greater than about 20:1, even more preferably greater than 40:1 and most preferably greater than about 70:1.

- Preferably the perfume is hydrophilic and is composed predominantly of ingredients
- 20 selected from two groups of ingredients, namely, (a) hydrophilic ingredients having a ClogP of less than about 3.5, more preferably less than about 3.0, and (b) ingredients having significant low detection threshold, and mixtures thereof. Typically, at least about 50%, preferably at least about 60%, more preferably at least about 70%, and most preferably at least about 80% by weight of the perfume is composed of perfume
- 25 ingredients of the above groups (a) and (b). For these preferred perfumes, the cyclodextrin to perfume weight ratio is typically of from about 2:1 to about 200:1; preferably from about 4:1 to about 100:1, more preferably from about 6:1 to about 50:1, and even more preferably from about 8:1 to about 30:1. Suitable perfume ingredients can be found in US
- 30 disclosure of the Trinh patent is incorporated herein by reference.

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*OPTIONAL AMINOCARBOXYLATE CHELATORS*

Chelators, e.g., ethylenediaminetetraacetic acid (EDTA), hydroxyethylene-diaminetriacetic acid, diethylenetriaminepentaacetic acid, and other aminocarboxylate chelators, and mixtures thereof, and their salts, and mixtures thereof, can optionally be used to increase antimicrobial and preservative effectiveness against Gram-negative bacteria, especially Pseudomonas species. Although sensitivity to EDTA and other aminocarboxylate chelators is mainly a characteristic of Pseudomonas species, other bacterial species highly susceptible to chelators include Achromobacter, Alcaligenes, Azotobacter, Escherichia, Salmonella, Spirillum, and Vibrio. Other groups of organisms also show increased sensitivities to these chelators, including fungi and yeasts. Furthermore, aminocarboxylate chelators can help, e.g., maintaining product clarity, protecting fragrance and perfume components, and preventing rancidity and off odors.

Although these aminocarboxylate chelators may not be potent biocides in their own right, they function as potentiators for improving the performance of other antimicrobials/preservatives in the compositions of the present invention. Aminocarboxylate chelators can potentiate the performance of many of the cationic, anionic, and nonionic antimicrobials/preservatives, phenolic compounds, and isothiazolinones, that are used as antimicrobials/preservatives in the composition of the present invention. Nonlimiting examples of cationic antimicrobials/preservatives potentiated by aminocarboxylate chelators in solutions are chlorhexidine salts (including digluconate, diacetate, and dihydrochloride salts), and Quaternium-15, also known as Dowicil 200, Dowicide Q, Preventol D1, benalkonium chloride, cetrimonium, myristalkonium chloride, cetylpyridinium chloride, lauryl pyridinium chloride, and the like. Nonlimiting examples of useful anionic antimicrobials/preservatives which are enhanced by aminocarboxylate chelators are sorbic acid and potassium sorbate. Nonlimiting examples of useful nonionic antimicrobials/preservatives which are potentiated by aminocarboxylate chelators are DMDM hydantoin, phenethyl alcohol, monolaurin, imidazolidinyl urea, and Bronopol (2-bromo-2-nitropropane-1,3-diol).

Examples of useful phenolic antimicrobials/preservatives potentiated by these chelators are chloroxylonol, phenol, tert-butyl hydroxyanisole, salicylic acid, resorcinol, and sodium o-phenyl phenate. Nonlimiting examples of isothiazolinone

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antimicrobials/preservatives which are enhanced by aminocarboxylate chelators are Kathon, Proxel and Promexal.

The optional chelators are present in the compositions of this invention at levels of, typically, from about 0.01% to about 0.3%, more preferably from about 0.02% to about 0.1%, most preferably from about 0.02% to about 0.05% by weight of the usage compositions to provide antimicrobial efficacy in this invention.

Free, uncomplexed aminocarboxylate chelators are required to potentiate the efficacy of the antimicrobials. Thus, when excess alkaline earth (especially calcium and magnesium) and transitional metals (iron, manganese, copper, and others) are present, free chelators are not available and antimicrobial potentiation is not observed. In the case where significant water hardness or transitional metals are available or where product esthetics require a specified chelator level, higher levels may be required to allow for the availability of free, uncomplexed aminocarboxylate chelators to function as antimicrobial/preservative potentiators.

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#### *METAL SALTS*

Optionally, but highly preferred, the present invention can include metallic salts for added odor absorption and/or antimicrobial benefit for the cyclodextrin solution. The metallic salts are selected from the group consisting of copper salts, zinc salts, and mixtures thereof.

Copper salts have some antimicrobial benefits. Specifically, cupric abietate acts as a fungicide, copper acetate acts as a mildew inhibitor, cupric chloride acts as a fungicide, copper lactate acts as a fungicide, and copper sulfate acts as a germicide. Copper salts also possess some malodor control abilities. See U. S. Pat. No. 3,172,817, Leupold, et al., which discloses deodorizing compositions for treating disposable articles, comprising at least slightly water-soluble salts of acylacetone, including copper salts and zinc salts, all of said patents are incorporated herein by reference.

The preferred zinc salts possess malodor control abilities. Zinc has been used most often for its ability to ameliorate malodor, e.g., in mouth wash products, as disclosed in U.S. Pat. Nos. 4,325,939, issued Apr. 20, 1982 and 4,469,674, issued Sept. 4, 1983, to N. B. Shah, et al., all of which are incorporated herein by reference. Highly-ionized and soluble zinc salts such as zinc chloride, provide the best source of zinc ions. Zinc borate

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functions as a fungistat and a mildew inhibitor, zinc caprylate functions as a fungicide, zinc chloride provides antiseptic and deodorant benefits, zinc ricinoleate functions as a fungicide, zinc sulfate heptahydrate functions as a fungicide and zinc undecylenate functions as a fungistat.

- 5            Preferably the metallic salts are water-soluble zinc salts, copper salts or mixtures thereof, and more preferably zinc salts, especially  $\text{ZnCl}_2$ . These salts are preferably present in the present invention primarily to absorb amine and sulfur-containing compounds that have molecular sizes too small to be effectively complexed with the cyclodextrin molecules. Low molecular weight sulfur-containing materials, e.g., sulfide  
10 and mercaptans, are components of many types of malodors, e.g., food odors (garlic, onion), body/perspiration odor, breath odor, etc. Low molecular weight amines are also components of many malodors, e.g., food odors, body odors, urine, etc.

- When metallic salts are added to the composition of the present invention they are typically present at a level of from about 0.1% to about 10%, preferably from about 0.2%  
15 to about 8%, more preferably from about 0.3% to about 5% by weight of the usage composition. When zinc salts are used as the metallic salt, and a clear solution is desired, it is preferable that the pH of the solution is adjusted to less than about 7, more preferably less than about 6, most preferably, less than about 5, in order to keep the solution clear.

## 20    *HUMECTANT*

- Optionally, the composition can contain a small amount of humectant, preferably at least about 0.001%, like glycerine, or inorganic hygroscopic material, to provide slower drying for clothing/fabrics treated with the compositions, to allow time for any wrinkles to disappear when the clothing/fabrics are hung to dry. For most purposes, this is preferably  
25 not present, since normally the user wants the clothing/fabrics to dry sooner.

## *CARRIER*

- Aqueous solutions are preferred for odor control. The dilute aqueous solution provides the maximum separation of cyclodextrin molecules on the fabric and thereby  
30 maximizes the chance that an odor molecule will interact with a cyclodextrin molecule.

            The preferred carrier of the present invention is water. The water which is used can be distilled, deionized, or tap water. Water not only serves as the liquid carrier for the

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cyclodextrins, but it also facilitates the complexation reaction between the cyclodextrin molecules and any malodorous molecules that are on the fabric when it is treated. It has recently been discovered that water has an unexpected odor controlling effect of its own. It has been discovered that the intensity of the odor generated by some polar, low molecular weight organic amines, acids, and mercaptans is reduced when the odor-contaminated fabrics are treated with an aqueous solution. Not to be bound by theory, it is believed that water solubilizes and depresses the vapor pressure of these polar, low molecular weight organic molecules, thus reducing their odor intensity.

#### 10 *OTHER OPTIONAL INGREDIENTS*

The composition of the present invention can optionally contain adjunct odor-controlling materials, chelating agents, antistatic agents, colorants, especially bluing agents, antioxidants, and mixtures thereof in addition to the cyclodextrin molecules. The total level of optional ingredients is low, preferably less than about 8.0%, more preferably less than about 5.0%, and even more preferably less than about 3.0%, by weight of the usage composition. These optional ingredients exclude the other ingredients specifically mentioned hereinbefore. Incorporating adjunct odor-controlling materials can enhance the capacity of the cyclodextrin to control odors as well as broaden the range of odor types and molecule sizes which can be controlled. Such materials include, for example, metallic salts, water-soluble cationic and anionic polymers, zeolites, water-soluble bicarbonate salts, and mixtures thereof.

##### Water-Soluble Polymers

Some water-soluble polymers, e.g., water-soluble cationic polymer and water-soluble anionic polymers can be used in the composition of the present invention to provide additional odor control benefits.

Cationic polymers, e.g., polyamines

Water-soluble cationic polymers, e.g., those containing amino functionalities, amido functionalities, and mixtures thereof, are useful in the present invention to control certain acid-type odors.

30 Anionic polymers, e.g., polyacrylic acid

Water-soluble anionic polymers, e.g., polyacrylic acids and their water-soluble salts are useful in the present invention to control certain amine-type odors. Preferred

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polyacrylic acids and their alkali metal salts have an average molecular weight of less than about 20,000, more preferably less than 5,000. Polymers containing sulfonic acid groups, phosphoric acid groups, phosphonic acid groups, and their water-soluble salts, and mixtures thereof, and mixtures with carboxylic acid and carboxylate groups, are also  
5 suitable.

Water-soluble polymers containing both cationic and anionic functionalities are also suitable. Examples of these polymers are given in U.S. Pat. 4,909,986, issued March 20, 1990 to N. Kobayashi and A. Kawazoe, incorporated herein by reference. Another example of water-soluble polymers containing both cationic and anionic functionalities is  
10 a copolymer of dimethyldiallyl ammonium chloride and acrylic acid, commercially available under the trade name Merquat 280® from Calgon.

#### Soluble Carbonate and/or Bicarbonate Salts

Water-soluble alkali metal carbonate and/or bicarbonate salts, such as sodium bicarbonate, potassium bicarbonate, potassium carbonate, cesium carbonate, sodium  
15 carbonate, and mixtures thereof can be added to the composition of the present invention in order to help to control certain acid-type odors. Preferred salts are sodium carbonate monohydrate, potassium carbonate, sodium bicarbonate, potassium bicarbonate, and mixtures thereof. When these salts are added to the composition of the present invention, they are typically present at a level of from about 0.1% to about 5%, preferably from about  
20 0.2% to about 3%, more preferably from about 0.3% to about 2%, by weight of the composition. When these salts are added to the composition of the present invention it is preferably that incompatible metal salts not be present in the invention. Preferably, when these salts are used the composition should be essentially free of zinc and other incompatible metal ions, e.g., Ca, Fe, Ba, etc. which form water-insoluble salts.

#### Antistatic Agents

The composition of the present invention can optionally contain an effective amount of antistatic agent to provide the treated clothes with in-wear static. Preferred antistatic agents are those that are water soluble in at least an effective amount, such that the composition remains a clear solution. Examples of these antistatic agents are  
30 monoalkyl cationic quaternary ammonium compounds, e.g., mono(C<sub>10</sub>-C<sub>14</sub> alkyl)trimethyl ammonium halide, such as monolauryl trimethyl ammonium chloride, hydroxycetyl hydroxyethyl dimethyl ammonium chloride, available under the trade name

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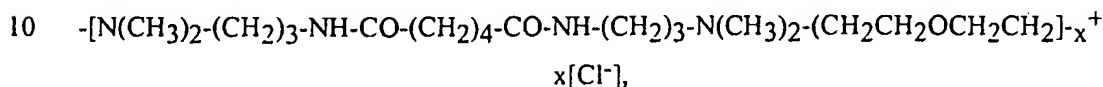
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Dehyquart E<sup>®</sup> from Henkel, and ethyl bis(polyethoxy ethanol) alkylammonium ethylsulfate, available under the trade name Variquat 66<sup>®</sup> from Witco Corp., polyethylene glycols, polymeric quaternary ammonium salts, such as polymers conforming to the general formula:

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available under the trade name Mirapol A-15<sup>®</sup> from Rhône-Poulenc, and



available under the trade name Mirapol AD-1<sup>®</sup> from Rhône-Poulenc, quaternized polyethyleneimines, vinylpyrrolidone/methacrylamidopropyltrimethylammonium chloride

15 copolymer, available under the trade name Gafquat HS-100<sup>®</sup> from GAF; triethonium hydrolyzed collagen ethosulfate, available under the trade name Quat-Pro E<sup>®</sup> from Maybrook; and mixtures thereof.

It is preferred that a no foaming, or low foaming, agent is used, to avoid foam formation during fabric treatment. It is also preferred that polyethoxylated agents such as  
20 polyethylene glycol or Variquat 66<sup>®</sup> are not used when alpha-cyclodextrin is used. The polyethoxylate groups have a strong affinity to, and readily complex with, alpha-cyclodextrin which in turn depletes the uncomplexed cyclodextrin available for odor control.

When an antistatic agent is used it is typically present at a level of from about  
25 0.05% to about 10%, preferably from about 0.1% to about 5%, more preferably from about 0.3% to about 3%, by weight of the usage composition.

#### Additional Odor Absorbers

When the clarity of the solution is not needed, and the solution is not sprayed on fabrics, other optional odor absorbing materials, e.g., zeolites and/or activated carbon, can  
30 also be used.



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### Zeolites

A preferred class of zeolites is characterized as "intermediate" silicate/aluminate zeolites. The intermediate zeolites are characterized by  $\text{SiO}_2/\text{AlO}_2$  molar ratios of less than about 10. Preferably the molar ratio of  $\text{SiO}_2/\text{AlO}_2$  ranges from about 2 to about 10.

- 5 The intermediate zeolites have an advantage over the "high" zeolites. The intermediate zeolites have a higher affinity for amine-type odors, they are more weight efficient for odor absorption because they have a larger surface area, and they are more moisture tolerant and retain more of their odor absorbing capacity in water than the high zeolites. A wide variety of intermediate zeolites suitable for use herein are commercially available as
- 10 Valfor® CP301-68, Valfor® 300-63, Valfor® CP300-35, and Valfor® CP300-56, available from PQ Corporation, and the CBV100® series of zeolites from Conteka.

Zeolite materials marketed under the trade name Abscents® and Smellrite®, available from The Union Carbide Corporation and UOP are also preferred. These materials are typically available as a white powder in the 3-5 micron particle size range.

- 15 Such materials are preferred over the intermediate zeolites for control of sulfur-containing odors, e.g., thiols, mercaptans.

### Activated Carbon

The carbon material suitable for use in the present invention is the material well known in commercial practice as an absorbent for organic molecules and/or for air

20 purification purposes. Often, such carbon material is referred to as "activated" carbon or "activated" charcoal. Such carbon is available from commercial sources under such trade names as; Calgon-Type CPG®; Type PCB®; Type SGL®; Type CAL®; and Type OL®.

### Colorant

Colorants and dyes, especially bluing agents, can be optionally added to the odor

25 absorbing compositions for visual appeal and performance impression. When colorants are used, they are used at extremely low levels to avoid fabric staining. Preferred colorants for use in the present compositions are highly water-soluble dyes, e.g., Liquitint® dyes available from Milliken Chemical Co. Non-limiting examples of suitable dyes are, Liquitint Blue HP®, Liquitint Blue 65®, Liquitint Patent Blue®, Liquitint Royal

30 Blue®, Liquitint Experimental Yellow 8949-43®, Liquitint Green HMC®, Liquitint Yellow II®, and mixtures thereof, preferably Liquitint Blue HP®, Liquitint Blue 65®,

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Liquitint Patent Blue<sup>®</sup>, Liquitint Royal Blue<sup>®</sup>, Liquitint Experimental Yellow 8949-43<sup>®</sup>, and mixtures thereof.

#### Optional Preservative

Optionally, but preferably, solubilized, water-soluble, antimicrobial preservative  
5 can be added to the composition of the present invention if the antimicrobial material C. is not sufficient, or is not present, because cyclodextrin molecules are made up of varying numbers of glucose units which can make them a prime breeding ground for certain microorganisms, especially when in aqueous compositions. This drawback can lead to the problem of storage stability of cyclodextrin solutions for any significant length of time.  
10 Contamination by certain microorganisms with subsequent microbial growth can result in an unsightly and/or malodorous solution. Because microbial growth in cyclodextrin solutions is highly objectionable when it occurs, it is highly preferable to include a solubilized, water-soluble, antimicrobial preservative, which is effective for inhibiting and/or regulating microbial growth in order to increase storage stability of the preferably  
15 clear, aqueous odor-absorbing solution containing water-soluble cyclodextrin.

Typical microorganisms that can be found in cyclodextrin supplies and whose growth can be found in the presence of cyclodextrin in aqueous cyclodextrin solutions include bacteria, e.g., Bacillus thuringiensis (cereus group) and Bacillus sphaericus; and fungi, e.g., Aspergillus ustus. Bacillus sphaericus is one of the most numerous members  
20 of Bacillus species in soils. Aspergillus ustus is common in grains and flours which are raw materials to produce cyclodextrins. Microorganisms such as Escherichia coli and Pseudomonas aeruginosa are found in some water sources, and can be introduced during the preparation of cyclodextrin solutions. Other Pseudomonas species, such as P. cepacia, are typical microbial contaminants in surfactant manufacturing facilities and may readily  
25 contaminate packed finished products. Typical other bacterial contaminants may include Burkholderia, Enterobacter and Gluconobacter species. Representative fungal species which may be associated with agricultural soils, crops and in the case of this invention, corn products such as cyclodextrins include Aspergillus, Absidia, Penicillium, Paecilomyces, and other species.

30 It is preferable to use a broad spectrum preservative, e.g., one that is effective on both bacteria (both gram positive and gram negative) and fungi. A limited spectrum preservative, e.g., one that is only effective on a single group of microorganisms, e.g.,

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fungi, can be used in combination with a broad spectrum preservative or other limited spectrum preservatives with complimentary and/or supplementary activity. A mixture of broad spectrum preservatives can also be used. In some cases where a specific group of microbial contaminants is problematic (such as Gram negatives), aminocarboxylate  
5 chelators may be used alone or as potentiators in conjunction with other preservatives. These chelators which include, e.g., ethylenediaminetetraacetic acid (EDTA), hydroxyethylenediaminetriacetic acid, diethylenetriaminepentaacetic acid, and other aminocarboxylate chelators, and mixtures thereof, and their salts, and mixtures thereof, can increase preservative effectiveness against Gram-negative bacteria, especially  
10 *Pseudomonas* species.

Antimicrobial preservatives useful in the present invention include biocidal compounds, i.e., substances that kill microorganisms, or biostatic compounds, i.e., substances that inhibit and/or regulate the growth of microorganisms.

Preferred antimicrobial preservatives are those that are water-soluble and are  
15 effective at low levels because the organic preservatives can form inclusion complexes with the cyclodextrin molecules and compete with the malodorous molecules for the cyclodextrin cavities, thus rendering the cyclodextrins ineffective as odor controlling actives. Water-soluble preservatives useful in the present invention are those that have a solubility in water of at least about 0.3 g per 100 ml of water, i.e., greater than about 0.3%  
20 at room temperature, preferably greater than about 0.5% at room temperature. These types of preservatives have a lower affinity to the cyclodextrin cavity, at least in the aqueous phase, and are therefore more available to provide antimicrobial activity. Preservatives with a water-solubility of less than about 0.3% and a molecular structure that readily fits into the cyclodextrin cavity, have a greater tendency to form inclusion complexes with the  
25 cyclodextrin molecules, thus rendering the preservative less effective to control microbes in the cyclodextrin solution. Therefore, many well known preservatives such as short chain alkyl esters of p-hydroxybenzoic acid, commonly known as parabens; N-(4-chlorophenyl)-N'-(3,4-dichlorophenyl) urea, also known as 3,4,4'-trichlorocarbanilide or triclocarban; 2,4,4'-trichloro-2'-hydroxy diphenyl ether, commonly known as triclosan are  
30 not preferred in the present invention since they are relatively ineffective when used in conjunction with cyclodextrin.

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The water-soluble antimicrobial preservative in the present invention is included at an effective amount. The term "effective amount" as herein defined means a level sufficient to prevent spoilage, or prevent growth of inadvertently added microorganisms, for a specific period of time. In other words, the preservative is not being used to kill  
5 microorganisms on the surface onto which the composition is deposited in order to eliminate odors produced by microorganisms. Instead, it is preferably being used to prevent spoilage of the cyclodextrin solution in order to increase the shelf-life of the composition. Preferred levels of preservative are from about 0.0001% to about 0.5%, more preferably from about 0.0002% to about 0.2%, most preferably from about 0.0003%  
10 to about 0.1%, by weight of the usage composition.

In order to reserve most of the cyclodextrins for odor control, the cyclodextrin to preservative molar ratio should be greater than about 5:1, preferably greater than about 10:1, more preferably greater than about 50:1, even more preferably greater than about 100:1.

15 The preservative can be any organic preservative material which will not cause damage to fabric appearance, e.g., discoloration, coloration, bleaching. Preferred water-soluble preservatives include organic sulfur compounds, halogenated compounds, cyclic organic nitrogen compounds, low molecular weight aldehydes, quaternary ammonium compounds, dehydroacetic acid, phenyl and phenolic compounds, and mixtures thereof.

20 The following are non-limiting examples of preferred water-soluble preservatives for use in the present invention.

#### Organic Sulfur Compounds

Preferred water-soluble preservatives for use in the present invention are organic sulfur compounds. Some non-limiting examples of organic sulfur compounds suitable for  
25 use in the present invention are:

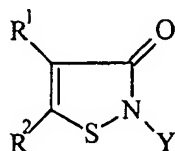
#### 3-Isothiazolone Compounds

A preferred preservative is an antimicrobial, organic preservative containing 3-isothiazolone groups having the formula:

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wherein

Y is an unsubstituted alkyl, alkenyl, or alkynyl group of from about 1 to about 18 carbon atoms, an unsubstituted or substituted cycloalkyl group having from about a 3 to about a 6 carbon ring and up to 12 carbon atoms, an unsubstituted or substituted aralkyl group of up to about 10 carbon atoms, or an unsubstituted or substituted aryl group of up to about 10 carbon atoms;

R<sup>1</sup> is hydrogen, halogen, or a (C<sub>1</sub>-C<sub>4</sub>) alkyl group; and

R<sup>2</sup> is hydrogen, halogen, or a (C<sub>1</sub>-C<sub>4</sub>) alkyl group.

Preferably, when Y is methyl or ethyl, R<sup>1</sup> and R<sup>2</sup> should not both be hydrogen. Salts of these compounds formed by reacting the compound with acids such as hydrochloric, nitric, sulfuric, etc. are also suitable.

This class of compounds is disclosed in U.S. Pat. No. 4,265,899, Lewis et al., issued May 5, 1981, and incorporated herein by reference. Examples of said compounds are: 5-chloro-2-methyl-4-isothiazolin-3-one; 2-n-butyl-3-isothiazolone; 2-benzyl-3-isothiazolone; 2-phenyl-3-isothiazolone, 2-methyl-4,5-dichloroisothiazolone; ; 5-chloro-2-methyl-3-isothiazolone; 2-methyl-4-isothiazolin-3-one; and mixtures thereof. A preferred preservative is a water-soluble mixture of 5-chloro-2-methyl-4-isothiazolin-3-one and 2-methyl-4-isothiazolin-3-one, more preferably a mixture of about 77% 5-chloro-2-methyl-4-isothiazolin-3-one and about 23% 2-methyl-4-isothiazolin-3-one, a broad spectrum preservative available as a 1.5% aqueous solution under the trade name Kathon® CG by Rohm and Haas Company.

When Kathon® is used as the preservative in the present invention it is present at a level of from about 0.0001% to about 0.01%, preferably from about 0.0002% to about 0.005%, more preferably from about 0.0003% to about 0.003%, most preferably from about 0.0004% to about 0.002%, by weight of the composition.

Other isothiazolins include 1,2-benzisothiazolin-3-one, available under the trade name Proxel® products; and 2-methyl-4,5-trimethylene-4-isothiazolin-3-one, available

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under the trade name Promexal®. Both Proxel and Promexal are available from Zeneca. They have stability over a wide pH range (i.e., 4-12). Neither contain active halogen and are not formaldehyde releasing preservatives. Both Proxel and Promexal are effective against typical Gram negative and positive bacteria, fungi and yeasts when used at a level  
5 from about 0.001% to about 0.5%, preferably from about 0.005% to about 0.05%, and most preferably from about 0.01% to about 0.02% by weight of the usage composition.

#### Sodium Pyrithione

Another preferred organic sulfur preservative is sodium pyrithione, with water solubility of about 50%. When sodium pyrithione is used as the preservative in the present  
10 invention it is typically present at a level of from about 0.0001% to about 0.01%, preferably from about 0.0002% to about 0.005%, more preferably from about 0.0003% to about 0.003%, by weight of the usage composition.

Mixtures of the preferred organic sulfur compounds can also be used as the preservative in the present invention.

#### 15 Halogenated Compounds

Preferred preservatives for use in the present invention are halogenated compounds. Some non-limiting examples of halogenated compounds suitable for use in the present invention are:

5-bromo-5-nitro-1,3-dioxane, available under the trade name Bronidox L® from  
20 Henkel. Bronidox L® has a solubility of about 0.46% in water. When Bronidox is used as the preservative in the present invention it is typically present at a level of from about 0.0005% to about 0.02%, preferably from about 0.001% to about 0.01%, by weight of the usage composition;

2-bromo-2-nitropropane-1,3-diol, available under the trade name Bronopol® from  
25 Inolex can be used as the preservative in the present invention. Bronopol has a solubility of about 25% in water. When Bronopol is used as the preservative in the present invention it is typically present at a level of from about 0.002% to about 0.1%, preferably from about 0.005% to about 0.05%, by weight of the usage composition;

1,1'-hexamethylene bis(5-(p-chlorophenyl)biguanide), commonly known as  
30 chlorhexidine, and its salts, e.g., with acetic and gluconic acids can be used as a preservative in the present invention. The digluconate salt is highly water-soluble, about 70% in water, and the diacetate salt has a solubility of about 1.8% in water. When

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chlorohexidine is used as the preservative in the present invention it is typically present at a level of from about 0.0001% to about 0.04%, preferably from about 0.0005% to about 0.01%, by weight of the usage composition.

1,1,1-Trichloro-2-methylpropan-2-ol, commonly known as chlorobutanol, with water solubility of about 0.8%; a typical effective level of chlorobutanol is from about 0.1% to about 0.5%, by weight of the usage composition.

4,4'-(Trimethylenedioxy)bis-(3-bromobenzamidine) diisethionate, or dibromopropamidine, with water solubility of about 50%; when dibromopropamidine is used as the preservative in the present invention it is typically present at a level of from about 0.0001% to about 0.05%, preferably from about 0.0005% to about 0.01% by weight of the usage composition.

Mixtures of the preferred halogenated compounds can also be used as the preservative in the present invention.

#### Cyclic Organic Nitrogen Compounds

Preferred water-soluble preservatives for use in the present invention are cyclic organic nitrogen compounds. Some non-limiting examples of cyclic organic nitrogen compounds suitable for use in the present invention are:

#### Imidazolidinedione Compounds

Preferred preservatives for use in the present invention are imidazolidione compounds. Some non-limiting examples of imidazolidinedione compounds suitable for use in the present invention are:

1,3-bis(hydroxymethyl)-5,5-dimethyl-2,4-imidazolidinedione, commonly known as dimethyloldimethylhydantoin, or DMDM hydantoin, available as, e.g., Glydant® from Lonza. DMDM hydantoin has a water solubility of more than 50% in water, and is mainly effective on bacteria. When DMDM hydantoin is used, it is preferable that it be used in combination with a broad spectrum preservative such as Kathon CG®, or formaldehyde. A preferred mixture is about a 95:5 DMDM hydantoin to 3-butyl-2-iodopropynylcarbamate mixture, available under the trade name Glydant Plus® from Lonza. When Glydant Plus® is used as the preservative in the present invention, it is typically present at a level of from about 0.005% to about 0.2% by weight of the usage composition;

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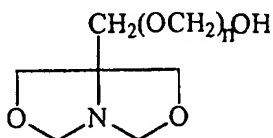
N-[1,3-bis(hydroxymethyl)2,5-dioxo-4-imidazolidinyl]-N,N'-bis(hydroxymethyl) urea, commonly known as diazolidinyl urea, available under the trade name Germall II® from Sutton Laboratories, Inc. (Sutton) can be used as the preservative in the present invention. When Germall II® is used as the preservative in the present invention, it is typically present at a level of from about 0.01% to about 0.1% by weight of the usage composition;

N,N"-methylenebis{N'-[1-(hydroxymethyl)-2,5-dioxo-4-imidazolidinyl]urea}, commonly known as imidazolidinyl urea, available, e.g., under the trade name Abiol® from 3V-Sigma, Unicide U-13® from Induchem, Germall 115® from (Sutton) can be used as the preservative in the present invention. When imidazolidinyl urea is used as the preservative, it is typically present at a level of from about 0.05% to about 0.2%, by weight of the usage composition.

Mixtures of the preferred imidazolidinedione compounds can also be used as the preservative in the present invention.

#### Polymethoxy Bicyclic Oxazolidine

Another preferred water-soluble cyclic organic nitrogen preservative is polymethoxy bicyclic oxazolidine, having the general formula:



20

where n has a value of from about 0 to about 5, and is available under the trade name Nuosept® C from Hüls America. When Nuosept® C is used as the preservative, it is typically present at a level of from about 0.005% to about 0.1%, by weight of the usage composition.

Mixtures of the preferred cyclic organic nitrogen compounds can also be used as the preservative in the present invention.

#### Low Molecular Weight Aldehydes

Formaldehyde



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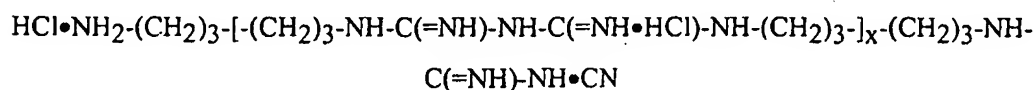
A preferred preservative for use in the present invention is formaldehyde. Formaldehyde is a broad spectrum preservative which is normally available as formalin which is a 37% aqueous solution of formaldehyde. When formaldehyde is used as the preservative in the present invention, typical levels are from about 0.003% to about 0.2%,  
5 preferably from about 0.008% to about 0.1%. more preferably from about 0.01% to about 0.05%, by weight of the usage composition.

#### Glutaraldehyde

A preferred preservative for use in the present invention is glutaraldehyde. Glutaraldehyde is a water-soluble, broad spectrum preservative commonly available as a  
10 25% or a 50% solution in water. When glutaraldehyde is used as the preservative in the present invention it is typically present at a level of from about 0.005% to about 0.1%, preferably from about 0.01% to about 0.05%, by weight of the usage composition.

#### Quaternary Compounds

Preferred preservatives for use in the present invention are cationic and/or  
15 quaternary compounds. Such compounds include polyaminopropyl biguanide, also known as polyhexamethylene biguanide having the general formula:



20

Polyaminopropyl biguanide is a water-soluble, broad spectrum preservative which is available as a 20% aqueous solution available under the trade name Cosmocil CQ® from ICI Americas, Inc., or under the trade name Mikrokill® from Brooks, Inc.

1-(3-Chlorallyl) -3,5,7-triaza-1-azoniaadamantane chloride, available, e.g., under  
25 the trade name Dowicil 200 from Dow Chemical, is an effective quaternary ammonium preservative; it is freely soluble in water; however, it has the tendency to discolor (yellow), therefore it is not highly preferred.

Mixtures of the preferred quaternary ammonium compounds can also be used as the preservative in the present invention.

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When quaternary ammonium compounds are used as the preservative in the present invention, they are typically present at a level of from about 0.005% to about 0.2%, preferably from about 0.01% to about 0.1%, by weight of the usage composition.

#### Dehydroacetic Acid

5 A preferred preservative for use in the present invention is dehydroacetic acid. Dehydroacetic acid is a broad spectrum preservative preferably in the form of a sodium or a potassium salt so that it is water-soluble. This preservative acts more as a biostatic preservative than a biocidal preservative. When dehydroacetic acid is used as the preservative it is typically used at a level of from about 0.005% to about 0.2%, preferably  
10 from about 0.008% to about 0.1%, more preferably from about 0.01% to about 0.05%, by weight of the usage composition.

#### Phenyl and Phenolic Compounds

Some non-limiting examples of phenyl and phenolic compounds suitable for use in the present invention are:

15 4,4'-diamidino- $\alpha,\omega$ -diphenoxypropane diisethionate, commonly known as propamidine isethionate, with water solubility of about 16%; and 4,4'-diamidino- $\alpha,\omega$ -diphenoxyhexane diisethionate, commonly known as hexamidine isethionate. Typical effective level of these salts is about 0.0002% to about 0.05% by weight of the usage composition.

20 Other examples are benzyl alcohol, with a water solubility of about 4%; 2-phenylethanol, with a water solubility of about 2%; and 2-phenoxyethanol, with a water solubility of about 2.67%; typical effective level of these phenyl and phenoxy alcohol is from about 0.1% to about 0.5%, by weight of the usage composition.

#### Mixtures thereof

25 The preservatives of the present invention can be used in mixtures in order to control a broad range of microorganisms.

Bacteriostatic effects can sometimes be obtained for aqueous compositions by adjusting the composition pH to an acid pH, e.g., less than about pH 4, preferably less than about pH 3, or a basic pH, e.g., greater than about 10, preferably greater than about 11.  
30 Low pH for microbial control is not a preferred approach in the present invention because the low pH can cause chemical degradation of the cyclodextrins. High pH for microbial control is also not preferred because at high pH's, e.g., greater than about 10, preferably

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greater than about 11, the cyclodextrins can be ionized and their ability to complex with organic materials is reduced. Therefore, aqueous compositions of the present invention should have a pH of from about 3 to about 10, preferably from about 4 to about 8, more preferably from about 4.5 to about 6. The pH is typically adjusted with inorganic molecules to minimize complexation with cyclodextrin.

## II> ARTICLE OF MANUFACTURE

The composition of the present invention can also be used in an article of manufacture comprising said composition plus a spray dispenser. When the commercial embodiment of the article of manufacture is used, it is optional, but preferable, to include the preservative. Therefore, the most basic article of manufacture comprises uncomplexed cyclodextrin, a carrier, and a spray dispenser.

### SPRAY DISPENSER

The article of manufacture herein comprises a spray dispenser. The cyclodextrin composition is placed into a spray dispenser in order to be distributed onto the fabric. Said spray dispenser is preferably any of the manually activated means for producing a spray of liquid droplets as is known in the art, e.g. trigger-type, pump-type, non-aerosol self-pressurized, and aerosol-type spray means. The spray dispenser herein does not normally include those that will substantially foam the clear, aqueous odor absorbing composition. It has been found that the performance is increased by providing smaller particle droplets. Desirably, the Sauter mean particle diameter is from about 10  $\mu\text{m}$  to about 120  $\mu\text{m}$ , more preferably, from about 20  $\mu\text{m}$  to about 100  $\mu\text{m}$ . Dewrinkling benefits are improved by providing small particles (droplets), as discussed hereinbefore, especially when the surfactant is present.

The spray dispenser can be an aerosol dispenser. Said aerosol dispenser comprises a container which can be constructed of any of the conventional materials employed in fabricating aerosol containers. The dispenser must be capable of withstanding internal pressure in the range of from about 20 to about 110 p.s.i.g., more preferably from about 20 to about 70 p.s.i.g. The one important requirement concerning the dispenser is that it be provided with a valve member which will permit the clear, aqueous odor absorbing composition contained in the dispenser to be dispensed in the form of a spray of very fine, or finely divided, particles or droplets. The aerosol dispenser utilizes a pressurized sealed

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container from which the clear, aqueous odor-absorbing composition is dispensed through a special actuator/valve assembly under pressure. The aerosol dispenser is pressurized by incorporating therein a gaseous component generally known as a propellant. Common aerosol propellants, e.g., gaseous hydrocarbons such as isobutane, and mixed halogenated hydrocarbons, which are not preferred. Halogenated hydrocarbon propellants such as chlorofluoro hydrocarbons have been alleged to contribute to environmental problems. Hydrocarbon propellants can form complexes with the cyclodextrin molecules thereby reducing the availability of uncomplexed cyclodextrin molecules for odor absorption. Preferred propellants are compressed air, nitrogen, inert gases, carbon dioxide, etc. A more complete description of commercially available aerosol-spray dispensers appears in U.S. Pat. Nos.: 3,436,772, Stebbins, issued April 8, 1969; and 3,600,325, Kaufman et al., issued August 17, 1971; both of said references are incorporated herein by reference.

Preferably the spray dispenser can be a self-pressurized non-aerosol container having a convoluted liner and an elastomeric sleeve. Said self-pressurized dispenser comprises a liner/sleeve assembly containing a thin, flexible radially expandable convoluted plastic liner of from about 0.010 to about 0.020 inch thick, inside an essentially cylindrical elastomeric sleeve. The liner/sleeve is capable of holding a substantial quantity of odor-absorbing fluid product and of causing said product to be dispensed. A more complete description of self-pressurized spray dispensers can be found in U.S. Pat. Nos. 5,111,971, Winer, issued May 12, 1992, and 5,232,126, Winer, issued Aug. 3, 1993; both of said references are herein incorporated by reference. Another type of aerosol spray dispenser is one wherein a barrier separates the odor absorbing composition from the propellant (preferably compressed air or nitrogen), as disclosed in U.S. Pat. No. 4,260,110, issued April 7, 1981, and incorporated herein by reference. Such a dispenser is available from EP Spray Systems, East Hanover, New Jersey.

More preferably, the spray dispenser is a non-aerosol, manually activated, pump-spray dispenser. Said pump-spray dispenser comprises a container and a pump mechanism which securely screws or snaps onto the container. The container comprises a vessel for containing the aqueous odor-absorbing composition to be dispensed.

The pump mechanism comprises a pump chamber of substantially fixed volume, having an opening at the inner end thereof. Within the pump chamber is located a pump stem having a piston on the end thereof disposed for reciprocal motion in the pump

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chamber. The pump stem has a passageway there through with a dispensing outlet at the outer end of the passageway and an axial inlet port located inwardly thereof.

The container and the pump mechanism can be constructed of any conventional material employed in fabricating pump-spray dispensers, including, but not limited to:

5 polyethylene; polypropylene; polyethyleneterephthalate; blends of polyethylene, vinyl acetate, and rubber elastomer. A preferred container is made of clear, e.g., polyethylene terephthalate. Other materials can include stainless steel. A more complete disclosure of commercially available dispensing devices appears in: U.S. Pat. Nos.: 4,895,279, Schultz,

10 Carter, issued June 23, 1981; all of said references are herein incorporated by reference.

Most preferably, the spray dispenser is a manually activated trigger-spray dispenser. Said trigger-spray dispenser comprises a container and a trigger both of which can be constructed of any of the conventional material employed in fabricating trigger-spray dispensers, including, but not limited to: polyethylene; polypropylene; polyacetal;

15 polycarbonate; polyethyleneterephthalate; polyvinyl chloride; polystyrene; blends of polyethylene, vinyl acetate, and rubber elastomer. Other materials can include stainless steel and glass. A preferred container is made of clear, e.g. polyethylene terephthalate. The trigger-spray dispenser does not incorporate a propellant gas into the odor-absorbing composition, and preferably it does not include those that will foam the odor-absorbing

20 composition. The trigger-spray dispenser herein is typically one which acts upon a discrete amount of the odor-absorbing composition itself, typically by means of a piston or a collapsing bellows that displaces the composition through a nozzle to create a spray of thin liquid. Said trigger-spray dispenser typically comprises a pump chamber having either a piston or bellows which is movable through a limited stroke response to the trigger

25 for varying the volume of said pump chamber. This pump chamber or bellows chamber collects and holds the product for dispensing. The trigger spray dispenser typically has an outlet check valve for blocking communication and flow of fluid through the nozzle and is responsive to the pressure inside the chamber. For the piston type trigger sprayers, as the trigger is compressed, it acts on the fluid in the chamber and the spring, increasing the

30 pressure on the fluid. For the bellows spray dispenser, as the bellows is compressed, the pressure increases on the fluid. The increase in fluid pressure in either trigger spray dispenser acts to open the top outlet check valve. The top valve allows the product to be

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forced through the swirl chamber and out the nozzle to form a discharge pattern. An adjustable nozzle cap can be used to vary the pattern of the fluid dispensed.

For the piston spray dispenser, as the trigger is released, the spring acts on the piston to return it to its original position. For the bellows spray dispenser, the bellows acts  
5 as the spring to return to its original position. This action causes a vacuum in the chamber. The responding fluid acts to close the outlet valve while opening the inlet valve drawing product up to the chamber from the reservoir.

A more complete disclosure of commercially available dispensing devices appears in U.S. Pat. Nos. 4,082,223, Nozawa, issued Apr. 4, 1978; 4,161, 288, McKinney, issued  
10 Jul. 17, 1985; 4,434,917, Saito et al., issued Mar. 6, 1984; and 4,819,835, Tasaki, issued Apr. 11, 1989; 5,303,867, Peterson, issued Apr. 19, 1994; all of said references are incorporated herein by reference.

A broad array of trigger sprayers or finger pump sprayers are suitable for use with the compositions of this invention. These are readily available from suppliers such as  
15 Calmar, Inc., City of Industry, California; CSI (Continental Sprayers, Inc.), St. Peters, Missouri; Berry Plastics Corp., Evansville, Indiana, a distributor of Guala® sprayers; or Seaquest Dispensing, Cary, Illinois.

The preferred trigger sprayers are the blue inserted Guala® sprayer, available from Berry Plastics Corp., or the Calmar TS800-1A®, TS1300®, and TS-800-2®, available  
20 from Calmar Inc., because of the fine uniform spray characteristics, spray volume, and pattern size. More preferred are sprayers with precompression features and finer spray characteristics and even distribution, such as Yoshino sprayers from Japan. Any suitable bottle or container can be used with the trigger sprayer, the preferred bottle is a 17 fl-oz. bottle (about 500 ml) of good ergonomics similar in shape to the Cinch® bottle. It can be  
25 made of any materials such as high density polyethylene, polypropylene, polyvinyl chloride, polystyrene, polyethylene terephthalate, glass, or any other material that forms bottles. Preferably, it is made of high density polyethylene or clear polyethylene terephthalate.

For smaller fluid ounce sizes (such as 1 to 8 ounces), a finger pump can be used  
30 with canister or cylindrical bottle. The preferred pump for this application is the cylindrical Euromist II® from Seaquest Dispensing. More preferred are those with precompression features.

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### III. METHOD OF USE

The present compositions can be used by distributing, e.g., by placing the aqueous solution into a dispensing means, preferably a spray dispenser and spraying an effective amount onto the desired surface or article. An effective amount as defined herein means an amount sufficient to absorb odor to the point that it is not discernible by the human sense of smell yet not so much as to saturate or create a pool of liquid on said article or surface and so that when dry there is no visual deposit readily discernible. Distribution can be achieved by using a spray device, a roller, a pad, etc.

Preferably, the present invention does not encompass distributing the cyclodextrin solution on to shiny surfaces including, e.g., chrome, glass, smooth vinyl, leather, shiny plastic, shiny wood, etc. It is preferable not to distribute the cyclodextrin solution onto shiny surfaces because spotting and filming can more readily occur on the surfaces. Although the cyclodextrin solution can be used on human skin, care should be taken when an antimicrobial active is present in the composition.

The present invention encompasses the method of spraying an effective amount of cyclodextrin solution onto household surfaces. Preferably said household surfaces are selected from the group consisting of countertops, cabinets, walls, floors, bathroom surfaces and kitchen surfaces.

The present invention encompasses the method of spraying a mist of an effective amount of cyclodextrin solution onto fabric and/or fabric articles. Preferably, said fabric and/or fabric articles include, but are not limited to, clothes, curtains, drapes, upholstered furniture, carpeting, bed linens, bath linens, tablecloths, sleeping bags, tents, car interior, etc.

The present invention encompasses the method of spraying a mist of an effective amount of cyclodextrin solution onto and into shoes wherein said shoes are not sprayed to saturation.

The present invention encompasses the method of spraying a mist of an effective amount of cyclodextrin solution onto shower curtains.

The present invention relates to the method of spraying a mist of an effective amount of cyclodextrin solution onto and/or into garbage cans and/or recycling bins.

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The present invention relates to the method of spraying a mist of an effective amount of cyclodextrin solution into the air to absorb malodor and to repel insects and dust mites.

5 The present invention relates to the method of spraying a mist of an effective amount of cyclodextrin solution into and/or onto major household appliances including, but not limited to: refrigerators, freezers, washing machines, automatic dryers, ovens, microwave ovens, dishwashers etc., to absorb malodor and to repel insects and dust mites.

The present invention relates to the method of spraying a mist of an effective amount of cyclodextrin solution onto cat litter, pet bedding and pet houses to absorb  
10 malodor and to repel insects and dust mites.

The present invention relates to the method of spraying a mist of an effective amount of cyclodextrin solution onto household pets to absorb malodor and to repel insects and dust mites.

The presence of the surfactant promotes spreading of the solution and the  
15 antimicrobial active provides improved odor control as well as antimicrobial action, by minimizing the formation of odors. Both the surfactant and the antimicrobial active provide improved performance and the mixture is especially good. When the compositions are applied in the form of the very small particles, as disclosed hereinbefore, additional benefits are found, since the distribution is even further improved and overall  
20 performance is improved.



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EXAMPLES

All percentages, ratios, and parts herein, in the Specification, Examples, and Claims are by weight and are approximations unless otherwise stated.

The following are non-limiting examples of the instant composition.

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Examples	I	II	III	IV
<u>Ingredients</u>	<u>Wt%</u>	<u>Wt%</u>	<u>Wt%</u>	<u>Wt%</u>
HPBCD(a)	1.0	--	0.5	1.0
RAMEB(b)	--	1.0	--	--
HPACD(c)	--	--	0.5	--
$\alpha$ -Cyclodextrin	--	--	--	0.5
8-ACA(d)	0.1	1.0	2.0	--
Merck 3535(e)		1.0		--
Oily component	1.0	0.5	0.1	--
DEET(f)	--	--	1.0	1.0
Ethanol	5.0	10.0	1.0	5.0
Pluronic 10 R5	0.2	--	--	--
Pluronic 25 R1	--	0.1	--	--
Tetronic 901	--	--	0.1	--
Tetronic 908	--	--	--	0.05
Perfume	0.1	0.05	0.05	0.05
Kathon	3 ppm	3 ppm	3 ppm	3 ppm
HCl	to pH 4.5	to pH 4.5	to pH 4.5	to pH 4.5
Distilled water	Bal.	Bal.	Bal.	Bal.

(a) Hydroxypropyl beta-cyclodextrin.

(b) Randomly methylated beta-cyclodextrin.

(c) Hydroxypropyl alpha-cyclodextrin.

10 (d) 8-acetoxycarvotanacetone.

(e) 3-n-butyl-n-acetyl aminopropionic acid.

(f) N,N-diethyl-m-toluamide

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Examples	<u>V</u>	<u>VI</u>	<u>VII</u>
<u>Ingredients</u>	<u>Wt%</u>	<u>Wt%</u>	<u>Wt%</u>
HPBCD(a)	1.0	--	1.5
RAMEB(b)	--	1.0	--
8-ACA(c)	8.0	2.0	--
Merck 3535(d)	5.0		--
Oily component	5.0	0.5	--
DEET	--	0.5	0.5
Ethanol	15.0	5.0	2.0
Tetronic 70 R2	0.2	--	--
Tetronic 130 R2	--	0.1	--
Dowfax 3B2	--	--	0.1
Perfume	0.1	0.05	0.05
Kathon	3 ppm	3 ppm	3 ppm
HCl	to pH 4.5	to pH 4.5	to pH 4.5
Distilled water	Bal.	Bal.	Bal.

(a) Hydroxypropyl beta-cyclodextrin.

5 (b) Randomly methylated beta-cyclodextrin.

(c) 8-acetoxycarvotanacetone.

(d) 3-n-butyl-n-acetyl aminopropionic acid.

(e) N,N-diethyl-m-toluamide

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Examples	<u>VIII</u>	<u>IX</u>	<u>X</u>	<u>XI</u>	<u>XII</u>
<u>Ingredients</u>	<u>Wt%</u>	<u>Wt%</u>	<u>Wt%</u>	<u>Wt%</u>	<u>Wt%</u>
HPBCD(a)	1.0	--	--	--	--
RAMEB(b)	--	1.0	--	--	--
8-ACA(c)	0.1	0.5	3.0	1.0	1.0
Merck 3535(d)				4.0	1.0
Oily component	0.1	1.0	1.0	4.0	0.5
Ethanol	5.0	1.0	2.0		20.0
Pluronic L-44	0.2	--	0.1	--	--
Tetronic 901	--	0.1	--	0.1	--
Silwet L-7604	--	--	--	--	0.1
Barquat 4250(e)	0.03	--	--	--	0.04
Bardac 2050(f)	--	0.03	--	0.03	--
Hyamine 1622(g)			0.05		
Perfume	0.1	--0.05	0.1	0.1	0.05
Kathon	3 ppm	3 ppm	3 ppm	3 ppm	3 ppm
HCl	to pH 4.5	to pH 4.5	to pH 3.5	to pH 3.5	to pH 3.5
Distilled water	Bal.	Bal.	Bal.	Bal.	Bal.

(a) Hydroxypropyl beta-cyclodextrin.

(b) Randomly methylated beta-cyclodextrin.

5 (c) 8-acetoxycarvotanacetone.

(d) 3-n-butyl-n-acetyl aminopropionic acid.

(e) Benzalkonium chloride, 50% solution.

(f) Dioctyl dimethyl ammonium chloride, 50% solution.

(g) Diisobutyl phenoxy ethoxy ethyl dimethyl benzyl ammonium chloride, 50% solution.

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The compositions of the above Examples are sprayed onto clothing using, e.g., the TS-800 sprayer from Calmar, and allowed to evaporate off of the clothing.

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Hydroxyethyl alpha-cyclodextrin and hydroxyethyl beta-cyclodextrin are obtained as a mixture from the hydroxyethylation reaction of a mixture of alpha-cyclodextrin and beta-cyclodextrin. They can be substituted for the HP-B-CD.

5 The compositions of the above Examples are sprayed onto clothing, a kitchen countertop, using a blue inserted Guala<sup>®</sup> trigger sprayer, available from Berry Plastics Corp. and a cylindrical Euromist II<sup>®</sup> pump sprayer available from Sequest Dispensing, respectively, and allowed to evaporate off of the clothing.

10 The polyalkylene oxide polysiloxane surfactants like the Silwet surfactants provide substantial improvements in the kill of the indicated common organisms. The Pluronic surfactants provide some improvement, but much less.

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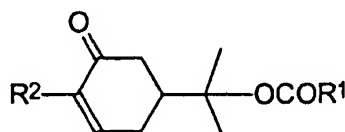
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## WHAT IS CLAIMED IS:

1. A stable, aqueous odor-absorbing composition comprising:
- (A). an effective amount to absorb malodors of solubilized, cyclodextrin;
  - (B). an insect and mite repellent composition which is in the form of a non-aqueous composition comprising an intimate mixture of:

- 5 (1) an effective amount of an active component having the following formula:



wherein R<sup>1</sup> and R<sup>2</sup> are independently selected from the group consisting of saturated, straight or branched alkyl groups having from 1 to about 10 carbons; and

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- (2) an oily component capable of solubilizing the active component, the oily component is selected from the group consisting of mineral oil, petrolatum, straight or branched, saturated or unsaturated hydrocarbons having from about 7 to about 40 carbon atoms, vegetable oils,

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hydrogenated vegetable oils, animal fats, animal oils, and C1-C30 mono- and poly- esters of sugars, and mixtures thereof;

- (C) optionally, from about 0.01% to about 30% by weight of the composition of low molecular weight alcohols, which preferably comprises ethanol; and
- (D) an aqueous carrier.

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2. The composition of claim 1, further comprising an effective amount of an emulsion forming component selected from the group consisting of a cyclodextrin compatible surfactant, a cyclodextrin compatible emulsifier, and mixtures thereof.

3. The composition of claim 1, wherein R<sup>1</sup> and R<sup>2</sup> are independently selected from saturated, straight or branched alkyl group of from 1 to about 3 carbons.

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4. The composition of claim 1, wherein the oily component has a melting point of less than 50 °C.

5. The composition of claim 1, wherein the cyclodextrin is present at a level of from about 0.01% to about 20% by weight of the composition, and wherein the active component is present at a level of from about 0.01% to about 8% by weight of the composition.

5

6. The composition of claim 1, wherein the cyclodextrin is present at a level of from about 0.01% to about 5% by weight of the composition and the emulsion forming component is present at a level of from about 0.03% to about 0.6% by weight of the composition.

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7. The composition of claim 1, wherein the cyclodextrin is present at a level of from about 0.1% to about 3%, by weight of the composition and the emulsion forming component is present at a level of from about 0.05% to about 0.3% by weight of the composition.

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8. The composition of claim 1, wherein the cyclodextrin is selected from the group consisting of beta-cyclodextrin, alpha-cyclodextrin, gamma-cyclodextrin, derivatives of the cyclodextrins, and mixtures thereof.

9. The composition of claim 8, wherein the cyclodextrin derivatives are selected from the group consisting of methyl substituted cyclodextrins, ethyl substituted cyclodextrins, hydroxyalkyl substituted cyclodextrins, branched cyclodextrins, cationic cyclodextrins, quaternary ammonium cyclodextrins, anionic cyclodextrins, amphoteric cyclodextrins, cyclodextrins wherein at least one glucopyranose unit has a 3-6-anhydro-cyclomalto structure, and mixtures thereof.

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10. The composition of claim 8, wherein the cyclodextrin is methylated beta-cyclodextrin.

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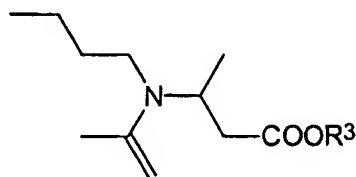
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11. The composition of claim 10, wherein the cyclodextrin is a mixture of methylated alpha-cyclodextrin and methylated beta-cyclodextrin.

12. The composition of claim 1, wherein the cyclodextrin is hydroxypropyl beta-cyclodextrin.

13. The composition of claim 1, further comprising additional active components of the general structure:



wherein R<sub>3</sub> is hydrogen or  $-(CH_2)_nCH_3$  and n is integer from about 0 to about 10.

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14. The composition of claim 1, additionally comprising adjuvant components selected from the group consisting of: low molecular weight polyols; an aminocarboxylate chelator; an effective amount of metallic salt for improved odor benefit; an effective amount of solubilized, water-soluble, antimicrobial preservative; an effective amount, to  
5 kill, or reduce the growth of microbes, of cyclodextrin compatible and water soluble antimicrobial active; and mixtures thereof.

15. An article of manufacture comprising the composition of claim 1, in a spray dispenser.

16. The article of manufacture of claim 15, wherein the spray dispenser comprises a trigger spray device and is capable of providing droplets with a weight average diameter of from about 10 to about 120  $\mu$ m.

17. A method of controlling odor on an inanimate surface comprising spraying an effective amount of the composition of claim 1 onto the surface using a trigger-spray device.

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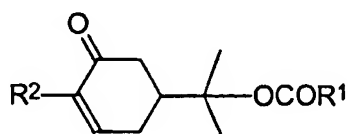
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18. A stable, aqueous odor-absorbing composition comprising:

- (A). an effective amount to absorb malodors of solubilized, cyclodextrin;  
(B). an insect repellent composition selected from the group consisting of N,N-diethyl-m-toluamide, a non-aqueous composition and mixtures thereof, wherein the non-aqueous composition comprises:

- (1) an effective amount of an active component having the following formula:



wherein R<sup>1</sup> and R<sup>2</sup> are independently selected from the group consisting of saturated, straight or branched alkyl groups having from 1 to about 10 carbons; and

- (2) an oily component capable of solubilizing the active component, the oily component is selected from the group consisting of mineral oil, petrolatum, straight or branched, saturated or unsaturated hydrocarbons having from about 7 to about 40 carbon atoms, vegetable oils, hydrogenated vegetable oils, animal fats, animal oils, and C1-C30 mono- and poly- esters of sugars, and mixtures thereof;

- (C) optionally, from about 0.01% to about 30% by weight of the composition of low molecular weight alcohols, which preferably comprises ethanol; and

- (D) an aqueous carrier.



## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/26582

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61L9/14 A61L9/012 A01N37/02 A01N25/08 A61L9/01  
 //(A01N37/02,37:46,25:08)

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61L A01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data, CHEM ABS Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 955 093 A (COBB DANIEL SCOTT ET AL) 21 September 1999 (1999-09-21) column 2, line 22 - line 36 column 28, line 58 - column 29, line 14 column 7, line 25 - column 8, line 14 column 3, line 27 - line 40 ---	1-18
Y	CN 1 105 658 A (KUNMING PLANT INST CHINESE ACA) 26 July 1995 (1995-07-26) cited in the application abstract ---	1-18
A	PATENT ABSTRACTS OF JAPAN vol. 018, no. 128 (C-1174), 2 March 1994 (1994-03-02) & JP 05 311509 A (KANEBO LTD), 22 November 1993 (1993-11-22) abstract ---	1-18
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☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## \* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance  
 "E" earlier document but published on or after the international filing date  
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 "O" document referring to an oral disclosure, use, exhibition or other means  
 "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

29 June 2000

Date of mailing of the international search report

18/07/2000

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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/26582

C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
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A	US 5 814 330 A (FRANÇOIS MARC KAREL JOZEF ET AL) 29 September 1998 (1998-09-29) column 2, line 18 - line 19 column 4, line 6 - line 16 column 4, line 37 - line 48 ----	1,2,4,18
A	US 4 127 672 A (KLIER MANFRED ET AL) 28 November 1978 (1978-11-28) column 2, line 23 - line 37 ----	13
A	US 2 932 665 A (HERCULES POWDER COMPANY) 12 April 1960 (1960-04-12) cited in the application column 1, line 15 - line 19 -----	18

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